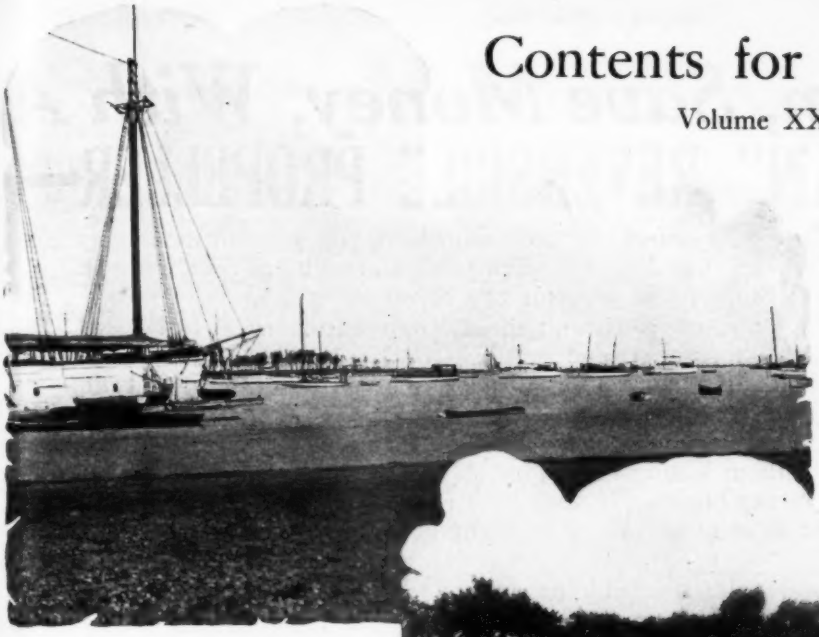
Contents for March, 1922

Volume XXIX, No. 3



The anchorage of the Chicago Motor Boat Club at Lincoln Park, Chicago. This city provides safe anchorage for all motor boats

CONSIDERABLE confusion still seems to exist in the minds of many in reference to the users' tax and the numbers, which every undocumented boat must carry on her bow. The tax and the numbers are two separate and distinct points which must be given attention in order to use one's boat on the federal waterways of the country.

Every undocumented motor boat—that is—every boat of less than 16 tons gross (with the exception of certain small craft powered with outboard motors) which is used for pleasure purposes must carry a number on each side of the bow, at least 3 inches high.

The users' tax is payable to *Collectors of Internal Revenue* of the district in which the owner resides. While a number is required on all undocumented boats (as noted above) yet boats of less than 32 feet in length or less than 5 tons net, are not required to pay a users' tax.

MOTOR BOATING ALONE GAINS IN CIRCULATION

According to the figures just received from the Audit Bureau of Circulation, MoToR BoatinG was the only boating paper which gained in circulation during the last six months of 1921 over the first six months of the same year, while all the other papers lost. MoToR BoatinG's circulation during the last six months of 1921 was 800 copies per month greater than during the first six, while Power Boating's was 3,140 per month less and Motor Boat's 325 less than during the first six months of 1921.

MoToR BoatinG's total circulation at present, according to the figures of the Audit Bureau of Circulation, is 20,896, which is 44% larger than Power Boating and 70% larger than Motor Boat.

MoToR BoatinG is published monthly by the International Magazine Company, William Randolph Hearst, president; C. H. Hathaway, vice-president; Ray Long, vice-president; Joseph A. Moore, treasurer; W. G. Langdon, secretary; 119 West 40th Street, New York, N. Y., U. S. A. Single Copies, 25 cents. Yearly subscription in United States and Canada, $3.00. In foreign countries, $4.00. When you receive notice that your subscription has expired it is best to renew it at once, using the blank enclosed. When requesting a change of mailing address, give the old as well as the new one. Allow four weeks for the first copy to reach the new address.

Advertising Index will be found on page 126

Examine Your Shaft

Before you put your boat over this spring, inspect your propeller shaft and all other underwater parts for traces of corrosion.

If there are signs of trouble, don't hesitate but replace all the corroded parts with Tobin Bronze. This remarkable bronze alloy is preferred by all experienced boat builders and naval engineers for such parts as propeller shafts, struts and steady bearings, propellers, rudders, rudder stocks, hull plates, centerboards, fin keels, fastenings, etc.

Because of its resistance to corrosion and tendency not to foul, Tobin Bronze is the only suitable material for salt water service. Its great smoothness and uniformity of texture make it easy to machine and permit a beautiful finish.

The original formula for Tobin Bronze is still owned exclusively by The American Brass Company which has been manufacturing this alloy for more than thirty years.

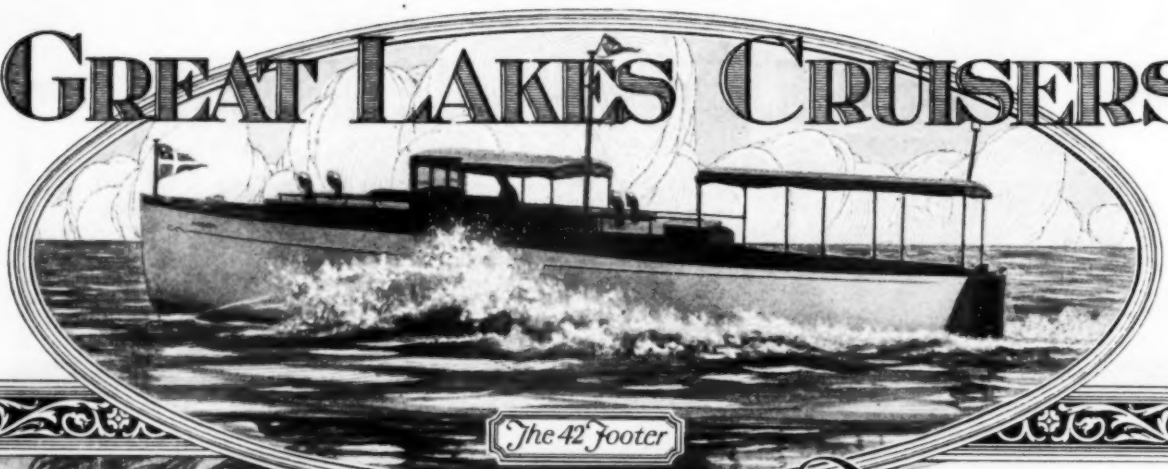
Specify TOBIN BRONZE, and be sure the specifications read, "Tobin Bronze manufactured by The American Brass Co."

Write for descriptive booklet.

THE AMERICAN BRASS COMPANY

ANSONIA BRANCH **ANSONIA, CONN., U. S. A.**

GREAT LAKES CRUISERS



The 42 Footer

The Spell of the Tropics

42-Ft. Standardized Express Cruiser
54-Ft. Standardized Express Cruiser

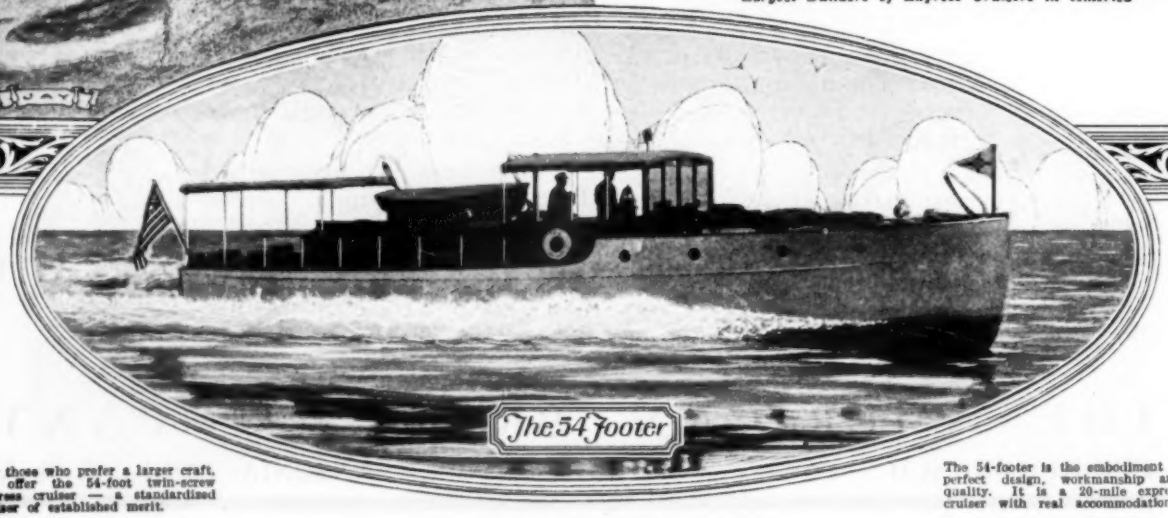
The arrangement plan of the 42-footer provides a completely equipped lavatory forward, galley, main cabin with upper and lower berths, bridge deck, engine compartment with full head room, and very large cockpit. The speed is 22-24 miles an hour.

The arrangement plan of the 54-footer provides crew's quarters forward, galley, main cabin with upper and lower berths, bridge deck, engine compartment with full head room, owner's stateroom with shower bath, and sizable cockpit. The speed is 25 miles an hour.

These cruisers are so sturdily constructed that any waters can be navigated in any kind of weather. Built to the highest standards known to the industry and furnished completely equipped in every respect, ready for operation.

Bulletin No. 209 describes the 42-footer.
Bulletin No. 338 describes the 54-footer.

Great Lakes Boat Building Corp.
MILWAUKEE WISCONSIN
Largest Builders of Express Cruisers in America



The 54 Footer

For those who prefer a larger craft, we offer the 54-foot twin-screw express cruiser — a standardized cruiser of established merit.

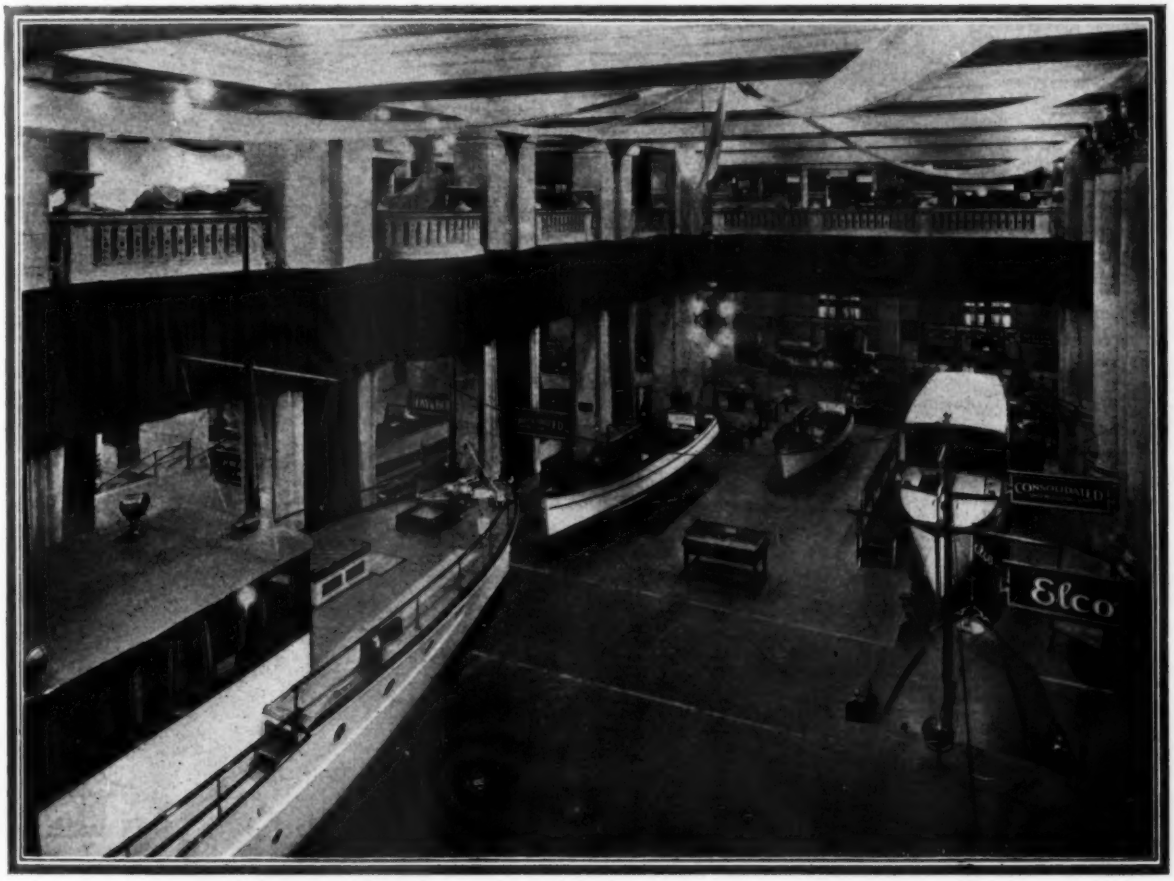
The 54-footer is the embodiment of perfect design, workmanship and quality. It is a 20-mile express cruiser with real accommodations.

Advertising Index will be found on page 126

MOTOR BOATING

119 West 40th St., New York, N. Y.

Photograph by M. Rosenfeld



General view of a portion of the main floor of the Grand Central Palace taken from the mezzanine floor

The Motor Boat Show of 1922

A Great Variety of Engines, Boats and Accessories Demonstrate the Continuous Progress and Improvement Being Made From Year to Year

IT is a long cry from the naphtha launch of the early nineties to the motor cruiser of the present twenties, but in the 1922 show of the National Association of Engine and Boat Manufacturers, both types were shown. The contrast of the little 21-foot open boat equipped with one of the old-fashioned standup naphtha engines and the palatial 54-foot two-cabin cruiser of the Elco Company shows as vividly as anything can show the advance which a generation has made in the development of motor boats.

But in a hundred other respects the Palace Motor Boat Show exemplified the strides which have been made in motor boating. It was the best show that we have ever had, and in all departments of boats, engines and accessories it revealed novelties that surprised even the oldtimers.

Since the last exhibition of motor boats (which took place not in 1921, but in December of 1920) the gospel of standardized boats has spread appreciably, and on the main floor of the Palace were seen numerous types of boats which are designed for quantity production to meet the average needs of average men. These ranged from 20-foot motor dories, such as produced by the Cape Cod Shipbuilding Corporation, and even smaller, to the floating homes of the Consolidated Shipbuilding Corporation, the Red Bank Yacht Works, Dauntless Shipyard, Gray, Richards, Elco, and so on.

The largest of them all was the 54-footer built by the Elco Company. Here was a cruiser with entirely enclosed bridge deck, with crew's quarters in the bow, owner's stateroom just abaft them, engine-room beneath the bridge, and combination dining-room and saloon with galley aft. The largest vessel that has ever been displayed at a motor boat show, it was a feat of unusual interest to get it from Bayonne to the Palace. Coming from the Jersey plant to the North River, it had the right of way on three tracks of the Jersey Central Railroad, and on the river it occupied an entire car float in solitary grandeur. Dimensions of

(*Continued on page* 68)

Know Your Engine

An Introduction to the Mysteries and Innermost Secrets of the Marine Motor, Why It Goes and What Makes It a Dependable Source of Power

By L. Huxtable

Photographs courtesy of Bruns, Kimball & Co.

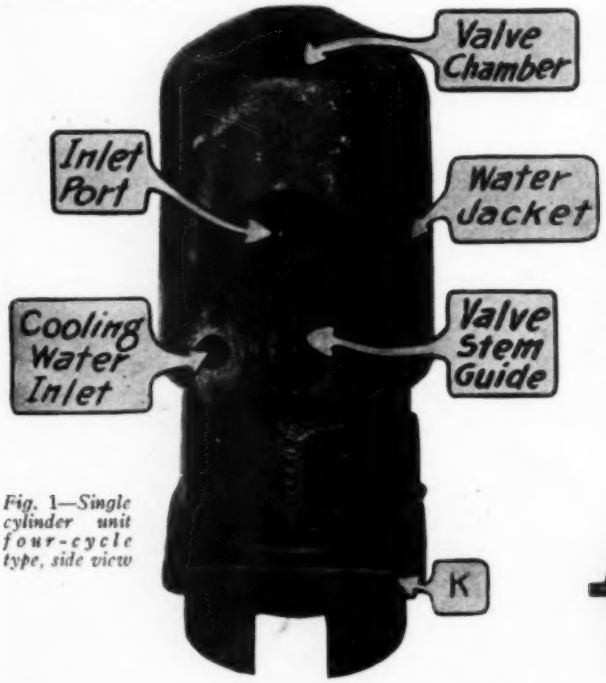


Fig. 1—Single cylinder unit four-cycle type, side view

MANY pamphlets, catechisms, books, and other literature have been prepared for educating the present or prospective owner of the gas engine. All of these have been criticized because of various short-comings, though many have been of great value. The principal objection, however, is because most of these assume that those whom they are to reach are technically informed. It is, therefore, the intention in this series of articles to treat the subject as though the reader is entirely ignorant on the subject of gas engines, and begin at the very beginning and teach the names of the various parts of a motor and their functions.

Fig. 2—The flywheel

IN announcing the beginning of a new series of articles on the principles of the modern marine internal combustion motor, MoToR BoatinG wishes to commend it particularly to the attention of the beginner in the sport. This series is to be written in a simple, easy style so that it can be readily understood by the most unskilled novice. This does not mean that the expert will not be benefited by following these articles. Mr. Huxtable, who is to prepare them for you, is an acknowledged expert in internal combustion engineering and MoToR BoatinG is proud to be able to present his articles to you. The series of articles will extend over several months and take you completely through the intricacies of your motor. One of the principal things which will be brought out by this series of articles on the marine motor will be to emphasize the differences between the modern marine motor and the aviation and automobile types. The series will also show why the last mentioned types are not suitable in their original state for use in the average motor boat.—Editor.

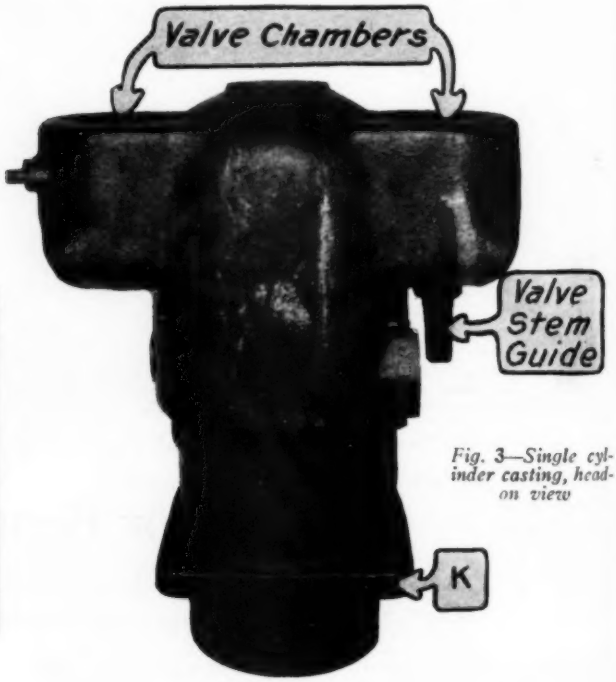


Fig. 3—Single cylinder casting, head-on view

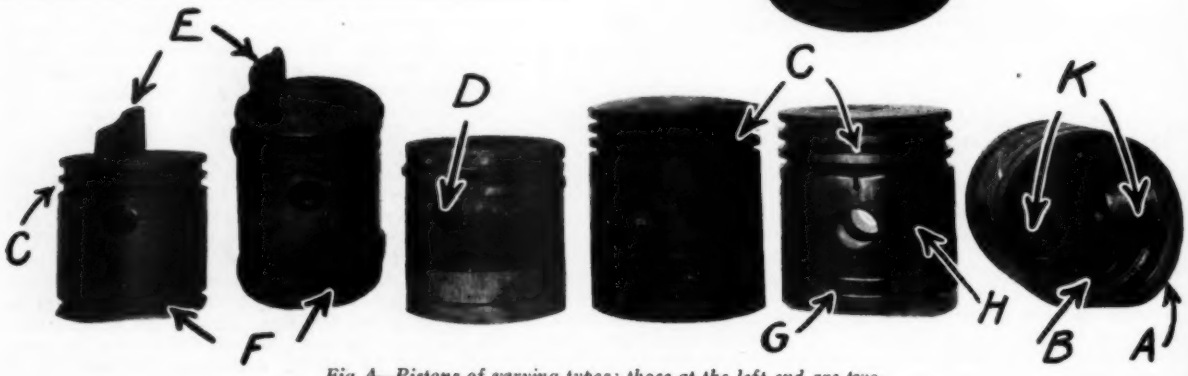
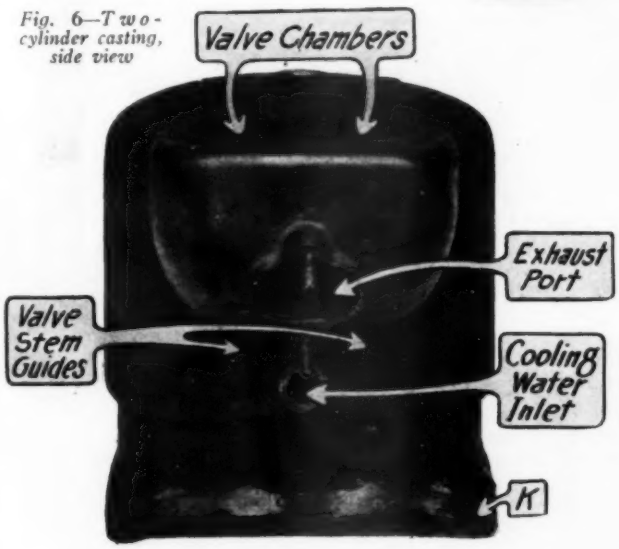


Fig. 4—Pistons of varying types; those at the left end are two-cycle with deflectors, number three has a concave top, number four a dome, the other with ring grooves of varying widths

Fig. 5—Two-cylinder casting, head-on view

Early in the nineteenth century, engineers were very active in their efforts to produce a successful explosive or internal combustion engine. The idea did not take a definite patentable shape until about 1826. Brown's gas-vacuum engine, produced about this time, was probably the first explosive engine that did real work. It was clumsy and unwieldy, and was relegated to a place among the failures of previous experimenters.

Fig. 6—Two-cylinder casting, side view



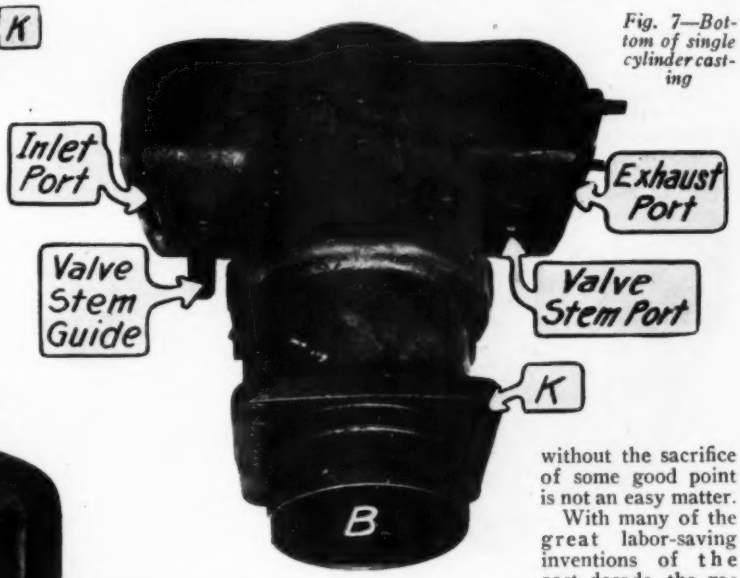
It was not until designers in the early nineties accepted the idea, that rapidity of action in both combustion and expansion was the basis of success in explosive motors, that real advancement in efficiency began. With this truth and the demand for small and safe motors, the manufacture of gas engines increased at a more rapid rate, and improvements in perfecting the details of this cheap and efficient motor have raised it to the dignity of a standard motor and a dangerous rival to the steam engine. Not only in small units of a few horsepower, but in ever increasing units to many hundred horsepower in a single cylinder. It is a very common occurrence to see coming into New York harbor 10,000 to 14,000 ton motor-driven ships, powered with engines of 2,500 horsepower each.

The application of the gasoline and oil motor to marine propulsion, to the horseless vehicles, the automobile, motorcycle, and bicycle, has had a most stimulating effect in adapting ways and means for applying this power to so many uses. For motor boats and as an auxiliary power for yachts and larger sailing vessels, the internal combustion motor has over-reached its steam competitor for economy and convenience, and is now the leading power.

The principal types of explosive motors have gone through a series of practical evolutions which have finally reduced the principles of action to a few permanent forms. These have been adopted in the design of motors as a result of their staying qualities and efficiency as shown by long continued use.

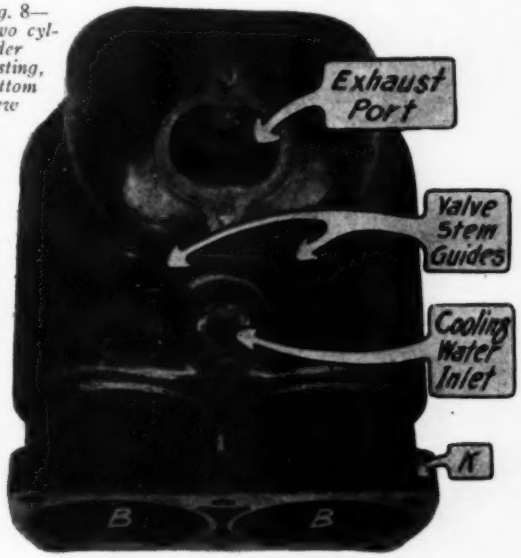
The gas, gasoline, or oil engine to approximate an ideal standard as a motor should be simple in design and not liable to get out of order. The parts must be readily accessible, the ignition of the charge must be positive and controlable, the motor must run quietly, and must be durable and economical in the use of fuel. The points of excellence have been striven for by many designers and builders with varying success. To get the entire combination, however, without the sacrifice of some good point is not an easy matter.

Fig. 7—Bottom of single cylinder casting



With many of the great labor-saving inventions of the past decade, the gas engine has developed speed and power never before dreamed of as a possibility. It takes rank to-day against the steam locomotive with a century's progress. It has

Fig. 8—Two cylinder casting, bottom view



made possible aerial navigation, low cost marine propulsion from the light canoe to the ocean-going liner. It operates machine tools, farming implements, pumps, lighting outfits, and machinery in mills and factories, replacing the steam engine.

There have been many different types of the explosive engine form of prime mover, all of which have operated with varying degrees of success. Because each class of work has individual characteristics, the same type of engine is not universally adaptable. By the elimination of the types that have not been so successful, we have in general use to-day:

1. Two-stroke cycle.
   a. Two port
   b. Three port
   c. Combined two and three port
2. Four-stroke cycle
   a. Automatic intake valve
   b. Mechanical intake valve
   c. Mushroom or poppet valve
   d. Sleeve valve
   e. Rotary valve

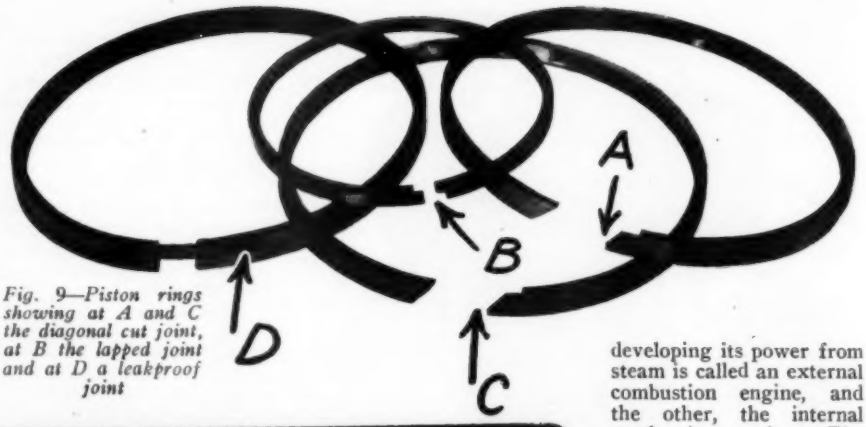


Fig. 9—Piston rings showing at A and C the diagonal cut joint, at B the lapped joint and at D a leakproof joint

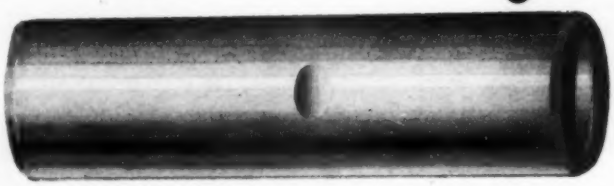


Fig. 10—A typical wrist pin showing the notch for securing it in piston

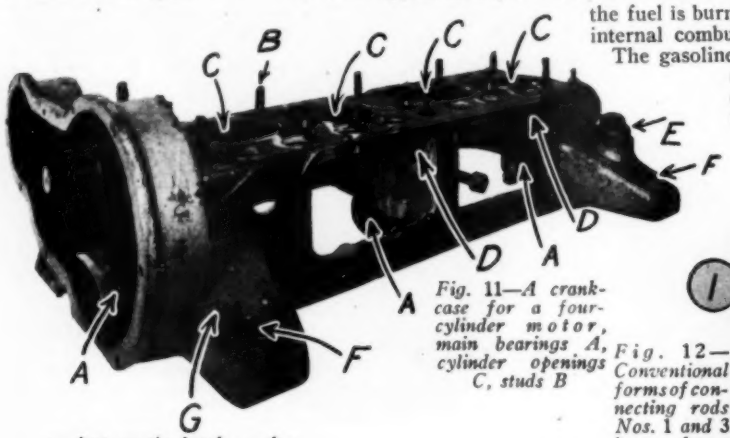


Fig. 11—A crankcase for a four-cylinder motor, main bearings A, cylinder openings C, studs B

There are two kinds of engines more or less familiar to everyone to-day; the steam engine and the gas engine as used in boats and automobiles. The one receiving or developing its power from steam is called an external combustion engine, and the other, the internal combustion engine. The reason for naming them in this way is because the fuel supplying the power in the steam engine is burned outside of the cylinder, hence, external combustion, while in the gas engine the fuel is burned inside the cylinder, hence, internal combustion.

The gasoline engine is sometimes spoken of as a motor, but to be clearly understood, or technically correct, the word engine should be used. Where self-starters are used, there is attached to the engine an electric motor, so that should one speak of the gas engine by calling it a motor, the reader may think you are speaking of the electric motor.

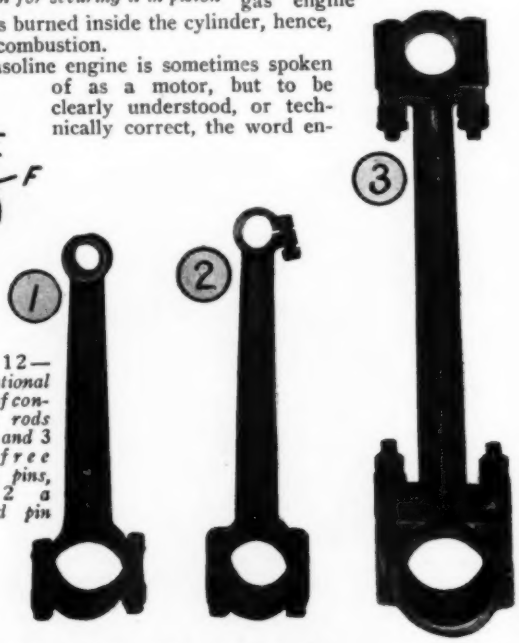


Fig. 12—Conventional forms of connecting rods Nos. 1 and 3 have free wrist pins, No. 2 a clamped pin

It must be remembered that there are two movements of

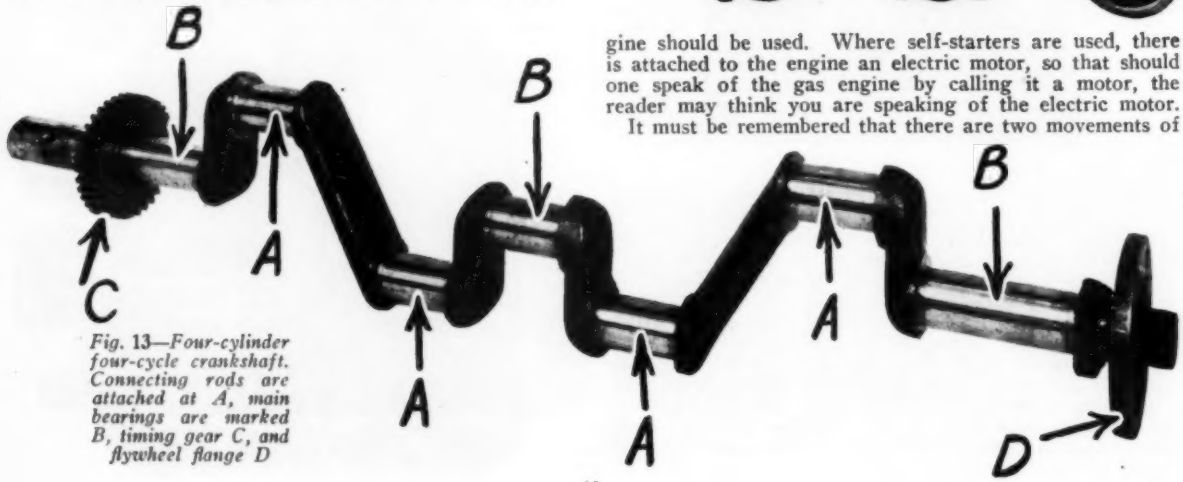
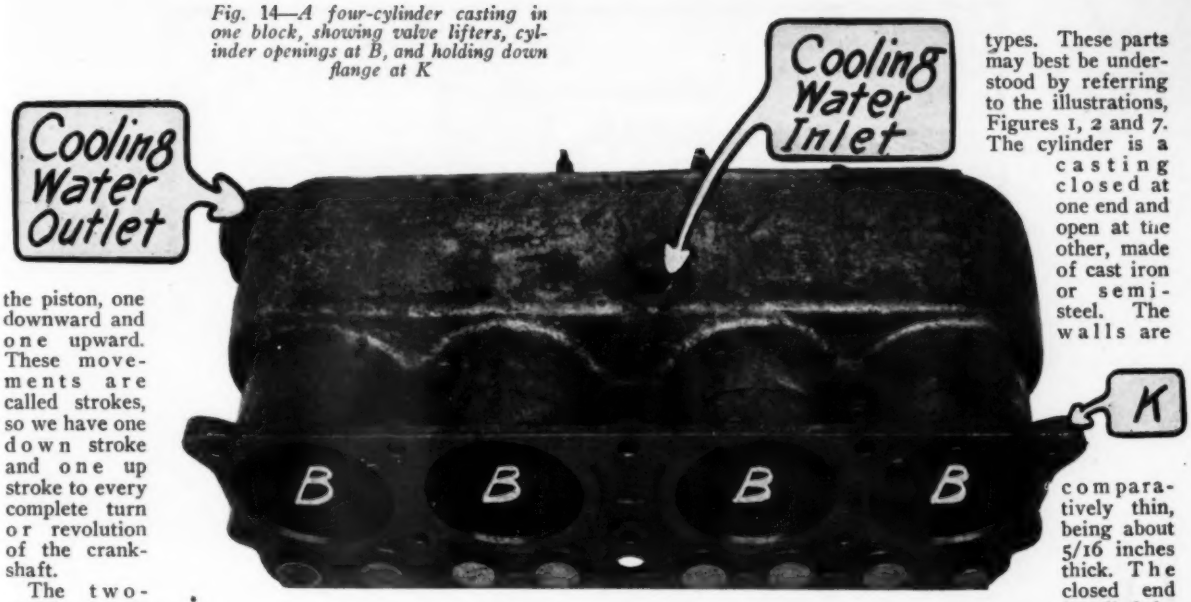


Fig. 13—Four-cylinder four-cycle crankshaft. Connecting rods are attached at A, main bearings are marked B, timing gear C, and flywheel flange D

Fig. 14—A four-cylinder casting in one block, showing valve lifters, cylinder openings at B, and holding down flange at K



the piston, one downward and one upward. These movements are called strokes, so we have one down stroke and one up stroke to every complete turn or revolution of the crankshaft.

The two-stroke cycle engine is one in which the work is completed in two strokes, while the four-stroke cycle engine requires four strokes of the piston. By common practice we omit the word stroke in speaking of the type of engine and say two-cycle or four-cycle, whereas, we mean that it is a type requiring either two or four strokes to complete the cycle of events occurring in the cylinder.

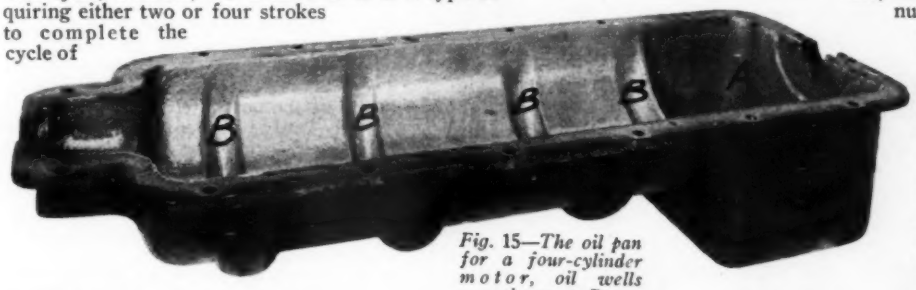


Fig. 15—The oil pan for a four-cylinder motor, oil wells shown at B

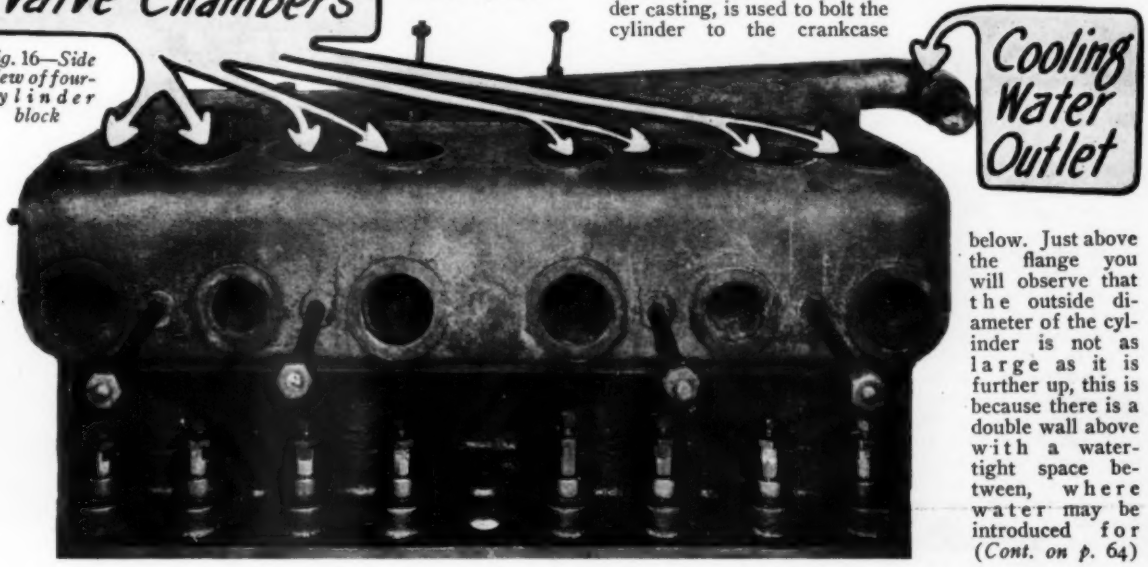
The principal parts of an engine are common to both the two-stroke and four-stroke cycle types. These parts may best be understood by referring to the illustrations, Figures 1, 2 and 7. The cylinder is a casting closed at one end and open at the other, made of cast iron or semi-steel. The walls are comparatively thin, being about 5/16 inches thick. The closed end is called the cylinder head, and may be a separate casting and bolted to the cylinder. The piston slides back and forth inside the casting, and fills the opening B, in Figs. 7, 8 and 14.

An engine may have but one cylinder, or again it may have any number. In small boats, one- and two-cylinder engines are very common, but where speed or higher power is desired, three, four, six, eight, and twelve-cylinder units are used, and in the very high-speed and high-powered boats, power plants with several combinations of the six, eight, and twelve cylinders are found. But whether the engine has one or twenty-four cylinders, the explanation of how it works or the operating principle, always remains the same.

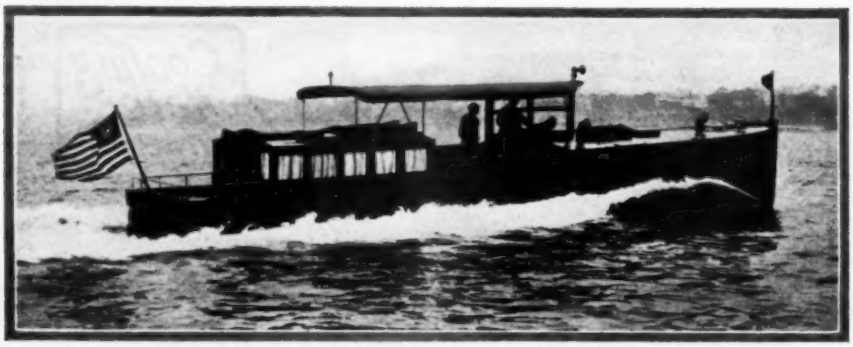
The engine may have its cylinder cast single, in pairs, or in block, as shown in Figs. 3, 6, 7, 8, 14 and 16. The flange K, at the bottom of the cylinder casting, is used to bolt the cylinder to the crankcase below. Just above the flange you will observe that the outside diameter of the cylinder is not as large as it is further up, this is because there is a double wall above with a watertight space between, where water may be introduced for

(*Cont. on p. 64*)

Fig. 16—Side view of four-cylinder block



Photographs by M. Rosenfeld



Early Bird's two Speedway motors drive her at 28 m. p. h.

Early Bird, a Fast Day Cruiser

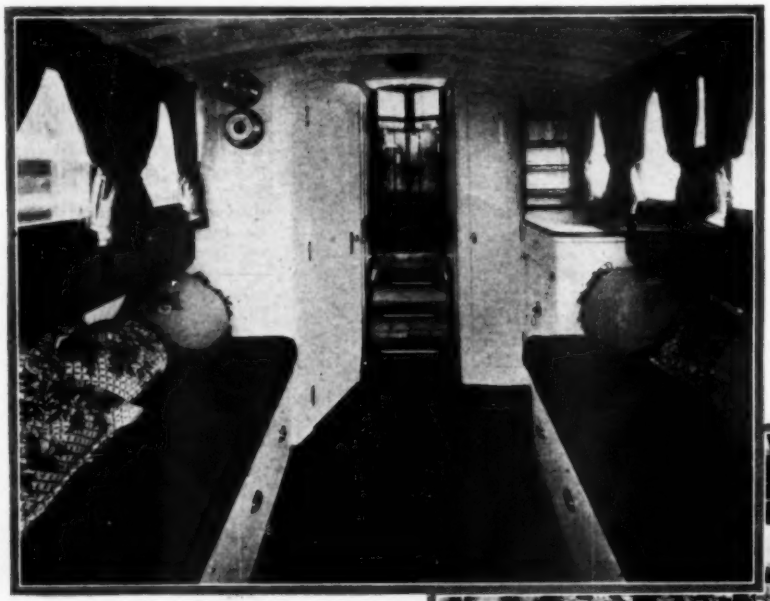
A Sporty Model of the Fast Ferry Type Which Is Becoming Increasingly Popular Each Year

ONE of the successful boats of the past season was Early Bird owned by E. K. Ruprecht of New York City. She was built and designed by the Consolidated Ship Building Corporation of Morris Heights, New York, and is an all mahogany day cruiser of 55 feet length. Her power equipment consists of two 8-cylinder Speedway motors of 200 h.p. each. These motors when turning at their normal rate give the boat a speed of over 28 m.p.h.

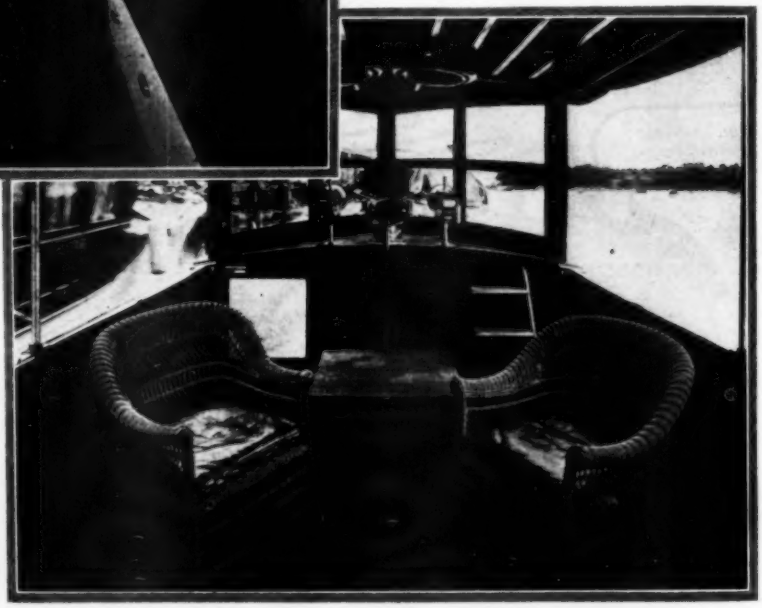
The sporty lines of this model show it to be one of the excellent examples of the type of fast ferry which are becoming more and more popular with the modern yachtsmen. The builders of this particular boat have to their credit numerous other successful craft of a similar type, all of which are used in fast ferry service from the summer homes of their owners on the shores of Long Island Sound to the business districts of New York. Among the more conspicuous of these can be mentioned H. P. Davison's Skipaki; George Bourne's Lone Star; J. H. Nunnally's Toxaway, and J. W. Kiser's Filette. All of these boats have given a good account of themselves in regular service during the past season. Owing to the reliability of their Speedway power plants the boats can be depended upon to be ready at all times for pleasure cruising or day sailing and the dependability of their equipment lends as much to the pleasure of the day's trip as does the design and appointments of the boat itself.

Early Bird is 55 feet long with a beam of 8 feet 6 inches and carries a crew of three men, that is, captain, engineer, and sailor. It has been found that this is ample to keep the boat up to first class condition without overburdening anyone of the crew.

Companionway stairs at the after end of the bridge deck lead down to the delightfully arranged day cabin.



The interior of the comfortable after saloon



Looking forward on the roomy bridge deck of Early Bird

The yacht tied up in Savannah River after her stormy trip down from New York

In Search of the Treasures of Treasure Island

An Interesting Cruise of an Auxiliary From New York to the Pacific in Search of Mythical Wealth

In Two Parts

By R. V. Rothermel

"No dream can come, no wish nor hope,
That lies beyond my present scope
Of power to take—"

THESE are three lines of a poem that my intelligence has always told me are fundamentally true. But somehow or other I never really expected that a practical application of them would come my way. Consequently, when my pet particular dream of hunting treasure on a desert island awoke to life and marked me for its prey, I was a dazed but willing victim. My routine work incidental to motion picture production could look after itself—I had been invited to sail away in a 60-foot schooner yacht to hunt for pirate gold on Cocos Island, which is none other than Stevenson's "Treasure Island."

Immediately I became an animated question mark. What kind of a yacht is it? What is the name of the island? Whose gold was it? Who put it there? When do we start?—were the questions that first slipped off my tongue. But before I had asked a single question I had commenced to wonder how best to spend my share of the treasure. I would have sedans and coupes and runabouts and touring cars, and I would buy an ex-submarine chaser and sink it with full honors, and—

But I took enough time off from spending my wealth to look up Cocos Island, the habitat of my fortune, in the records of the National Geographic Society. Cocos, I found, is in the Pacific Ocean, about 325 miles off the coast of Costa Rica, opposite Punta Arenas, and approximately 450 miles from the Colombian coast of South America. It is uninhabited, except by the members of treasure hunting expeditions.

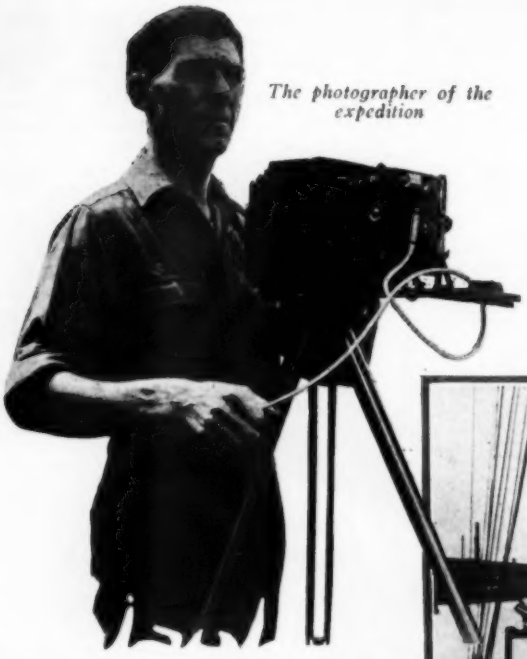
Through the governments of Costa Rica, Chile, and Peru I learned about the treasure. It consists of forty millions in gold and silver coin and five millions in jewels and church ornaments. Costa Rica, which owns the island, owns the treasure, but doesn't know where it is. Chile, which won its liberation from the Spanish yoke in 1820, tried unsuccessfully to seize the treasure from Peru, which government lost it through the rascality of a Nova Scotian captain, W. D. Morgan, of the barque Mary Deer.

This wealth of gold and jewels, belonging to the influential Spaniards of Peru, was placed aboard Mary Deer in the harbor of Callao, by the Viceroy of Peru, who feared that the rapidly approaching republican army of Chile would capture it. Mary Deer was the safest and largest boat then in port, and her captain was an honest man. But the thought of so much treasure beneath his decks snapped the thread of Captain Morgan's honor and sent the Jolly Roger fluttering to the main peak of his ship.

The author on watch at the wheel, showing his great interest in the course being steered

Under cover of the night, the Viceroy's guards were murdered, and Mary Deer slipped her mooring quietly and headed to sea with a treasure that would stir the cupidity of almost any man. She sailed northward, crossed the equator, and before long was anchored in Wafer Bay, one of two harbors of Cocos Island, then frequently used as a pirate rendezvous. All the authentic historical records agree that the gold and jewels were buried somewhere near the small river that empties into Wafer Bay. But where? Here we pick up the skein that, tangled and broken, brings us down to the summer of 1921 and the expedition of the auxiliary schooner yacht Adventuress.

After the treasure had been buried and Mary Deer had put to sea again, her crew decided that the booty should have been divided among them so that each might go his way and live in revelry and riot. Failing to secure the



The photographer of the expedition

consent of the captain and his officers to return to Cocos and pick up the treasure, they mutinied and, as usual, killed off all who opposed them. Having done so, they found that they had made the mistake of murdering everyone who could navigate them back to that speck of land in the vast sea. Hopelessly they sailed back and forth for days and days until they were overtaken by a Chilean warship and made captive.

Being close to Callao at the time, the warship put to port and strung up all but three of the mutineers. These were kept prisoners aboard, and because of the man-eating habits of the enormous sharks in Callao harbor, no thought was given to the possibility of their escape. The three desperate men had a thought of their own, however, and one night slipped overboard and swam safely to an American whaler nearby. Here is where history ends, but it is believed that one of the trio had succeeded in concealing and retaining the map made by Captain Morgan showing the exact location of the buried treasure.

At any rate, we find that in 1870 a cabin boy of a British ship purchased an old-fashioned musket in a New Orleans pawn shop and discovered in the spring cavity a tightly rolled map of Cocos Island. This is the map that the desperado of 1820 stole from the dead body of Captain Morgan. How do we know it is the same map? By the intuitive faith that guided Robert Louis Stevenson and Edgar Allen Poe. It is admittedly the weak point in the story, but the rest of it runs smooth and true.

Not knowing the whereabouts of Cocos Island, but believing that a map so carefully secreted had some unusual value, the cabin boy placed it under the cover of his Bible and carried it with him on all his travels. In 1886 he was shipwrecked near an Indian village in the Hudson Bay country. There he fell in love with an Indian maiden, there he was married by a missionary (who used his own Bible), and there he lived in peace and quiet for thirty-three years, the map totally forgotten, but still in his possession.

In 1919 a missionary schooner visited the Indian village, laden with salvation and magazines, and in one of the periodicals the cabin boy, then an old man of 64, read with awakening memory of the many trips for treasure made to Cocos Island by Lord Grey, father of the present Earl Grey. He took the map from its hiding place, studied it, and, convinced that he held the key to fabulous fortune,

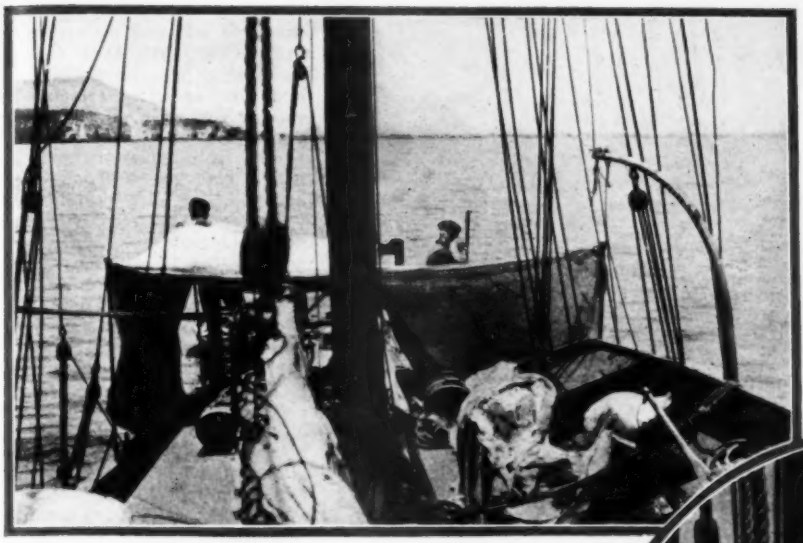
Adventuress at the dock at Savannah, Ga.

set out with his wife in the direction of civilization. By dog sled, on foot, and in canoe they journeyed for weeks, and finally came to Moose Factory, the nearest trading post, and one that recently figured in the news as the point of rescue of three American naval balloonists.

At Moose Factory the old man and his story were so ridiculed that he moved on to Cochrane, an important town in that country, but one no less skeptical of the squaw man's incredible yarn. The story was told again and again, the map was shown, and untiring effort was made to interest gold in the search for gold. Unaccustomed to the life of the white man, the Indian wife died, and finally, with discouragement following grief, the old sailor traded his only possession for an outfit to take him back to his Indians of the North.

The Swedish storekeeper who bought the map must have acted through compassion and sympathy, for it changed hands again almost immediately, passing back into the ownership of a seafaring man. This man, Captain William McGrath, is a Canadian by birth, but a citizen of the world by inclination. He knows the Pacific Ocean as I know Central Park, and he had long been acquainted with Cocos Island. He had been to the island himself, and when he saw the map he was sure that his fortune was made, for whereas all previous searchers had been led to dig close to the beach, the cross on

Looking down on the deck of Adventuress; taken from the cross-trees of a big schooner alongside



At anchor in Gonave Bay, Hayti. Placing an awning over the cockpit. Note the motor tender on the port side

the map indicated a likely location a short distance inland.

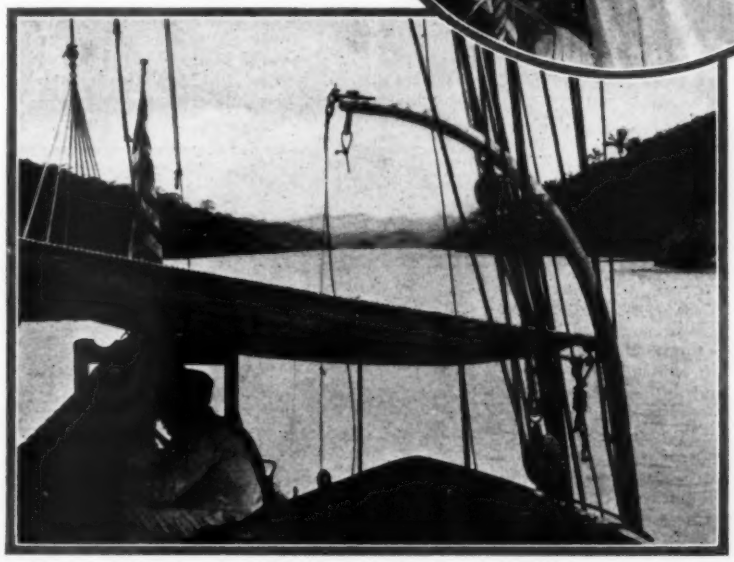
McGrath speedily left Cochrane, came to New York, found the man who would buy and outfit the 60-foot Adventuress, collected part of the crew, and set sail for Savannah, Ga. Off Hatteras the yacht ran into a couple of snorters that blew her 200 miles off her course and added two weeks to her running time. But she turned up safe and sound, the crew loud in their praise of her seaworthiness, and it only remained to recruit the rest of the ship's company in New York and set sail. And here is where I catch up with and come into the story.

When the invitation came to me I made short work of my moving picture connections and, on a warm day in June, found myself in Savannah, getting acquainted with the gallant sailors and sailoress of the schooner Adventuress. These intrepid adventurers were George Seabury, the owner, who had made many trips to Flatbush and for years lived among the natives of Brooklyn; his wife, Mabel, whose greatest charm was a never-failing pluck and youthful spirit; his son, Larry, who, before the cruise was over, developed the most marvelous display of whiskers ever observed; Jack Nugent, a young New York harbor pilot, who didn't let profanity prevent him from saying what was on his mind, and Captain McGrath, who had the map and two natures, one for use on land and the other of no use whatever, but especially so at sea. But no matter; there was no bloodshed on the trip. Nor was there any treasure to fight over.

Adventuress was a boat built to stand up under the heaviest weather, as she proved on more than one occasion. A topsail schooner of beautiful proportions, 45 feet on the waterline, she carried an enormous spread of sail in perfect safety, being ballasted with tons of lead on a deep keel that gave her the unusual draft of 9 feet. Besides sail-power she was equipped with a large two-cylinder heavy-duty motor that was worth its weight in gold in emergencies, but that proved to be a reluctant starter. If you petted her and talked nicely she was acquiescence itself, but if you acted brusque and rude-like she would probably break your arm. A couple of times she did take the starting bar in her teeth and reduce the port side engine-room partition to kindling wood.

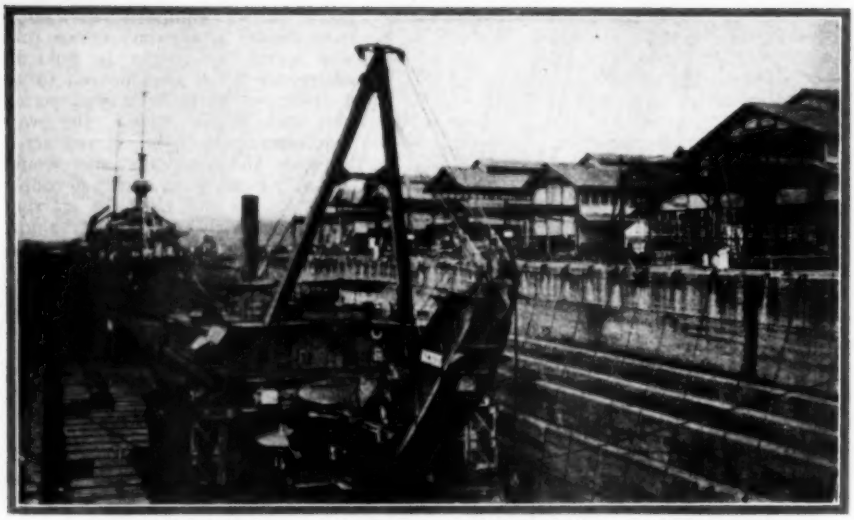
She was fitted with unusually large water and gasoline tanks, and her bottom was sheathed with copper as a protection against the deadly worms of the South Seas. Equipped with new running gear and tackle, new cables, new anchors, complete diving apparatus, and hundreds of dollars' worth of provisions, she was ready to sail when I joined the crew in the capacity of engineer and camera man.

Wondering how soon chow will be ready



Typical country-side bordering the canal. Just before going through Culebra Cut

On the 17th of June we left the fragrant harbor of Savannah, wound down the river, and under a stiff breeze headed out to sea. While still in the calm waters of the Savannah we had been called to chow by Mrs. Seabury,



One of the big dredges on the canal in dry dock at Balboa. Behind her is the French battle cruiser Jules Michelet that took Gen. Mangin to Callao, Peru

and had copiously surrounded a wonderful feed of boiled ham, cabbage, peas, and potatoes. We heartily thanked the good lady, who, yielding to her husband's pleading, had finally agreed to sign on as the member of the crew who would have to cater to the gastronomic idiosyncrasies of five men. An unpleasant job ashore, it was at sea unholy. But the kind providence which looks after all sailors brought along a storm, and for ten days of the eleven occupied in running to Cape Foux, Hayti, Mrs. Seabury was relieved of her duties because seasickness rendered her incapable of cooking and most of the crew incapable of eating.

During this time while the Seaburys were wrestling with internal devils, Billy, as the captain was always called, Jack, and myself rustled in the galley for ourselves, and our meals were movable feasts, likely to come at any hour or not at all. In the last three days of our run, after we had been hove to for a day and a half, and while we were passing through Mira por Vos and the Windward Passage, the captain worked the hide off us putting up sail and taking in sail as he saw or thought he saw a squall headed our way. I believe in prudence and caution, but I say it is much, much too much, when you are ordered to douse sail for the steenth time before chow because the captain says it is blowing sixty miles an hour outside, and you find that "outside" means forty miles away. Jack Nugent put this same thought over in language that was beautiful and lovely, but oh so elemental!

Our first anchorage in Hayti was in Gonave Bay, where at the town of Gonaives we procured fresh vegetables, fruit, and bread. There we were visited by the colored port captain and quarantine officer, to whom we showed our roving yacht commission, and with whom I found it more convenient to talk in their native French than through their incomprehensible interpreter. As these dusky officials shoved off, we turned to welcome the collector of customs and a lieutenant of marines, two business-like Americans, escorted by a boatload of native soldiers in spotless khaki. These two Americans made our short stay in Gonaives most pleasant, and when we left, they saw to it that we had all the vegetables and fruit we could carry.

From Gonaives we headed to La Source, a little native settlement on Gonave Island, which, lest you be confused by the name, is something else again from the village of Gonaives or Gonave Bay. Here, we had been told, a motor yacht was sunk in 1917 with $107,500 in gold aboard. George had the dope straight from a man who knew a German who was on the yacht, but when we got to the spot and examined with a water glass the reef on which the yacht had gone aground, we saw nothing but sand and seaweed. Blasted hopes, blasphemous language, and all that! All aboard for Kingston!

We approached this harbor on a beautiful Sunday morning with all sail set and the old windjammer just tearing through the water. A sporty Englishman, whom we met later at the yacht club, said he had been watching us through his glasses and had wondered what new racing yacht had come to visit Jamaica. That evening, when we had passed through all the port formalities, we came to anchor close to a Merritt-Chapman wrecking tug, whose pugilistically enthusiastic crew woke us on the next morning by announcing to all the world, and to us in particular, that Dempsey had licked Carpentier. This was the Fourth of July.

Spending a week in sightseeing at Kingston, we were wonderfully entertained by members of the yacht club, which is one of the very few in the world boasting a royal charter from the English crown. When we had finished our pleasant stay in Kingston, we loaded up to the guards with fresh water and set out for Cristobal in company with the large American cargo ship Western Knight. As we got under way I waved a regretful good-by to the Lyons brothers, Frank, Alan, and Harry, who had done all but stand on their heads to make our visit an enjoyable one.

At sea, as darkness came on, we parted company with the Western Knight, only to pick her up again three and a half days later as she followed us through the breakwater at the Atlantic entrance to the Panama Canal. Under sail power alone we had beaten her across the Caribbean by several hours. With our lee rail under water all the way across, this run furnished us the finest sailing in all our 4,500-mile trip.

(*Continued on page 70*)

Rothermel explaining a bit of business to Mabel for a scene in the movie that was made on the beach

Fig. 1—*Make a bight in the one end and pass the other up through it*

Fig. 2—*Pass the end round underneath the bight—*

The Sheet Bend

An Unjambable Knot Used for Bending on the Jib Sheets, for Joining a Small Rope to a Larger and Where a Heavy Strain is Anticipated

Fig. 3—*And through its own bight or loop on top of the standing bight and haul tight. If a very heavy strain is anticipated put a piece of wood through the knot, parallel to the black end.*

Fig. 4—*Where there is much difference between the sizes of the ropes or they are greasy, pass the end round again, forming a double sheet bend. The black part would, of course, be the smaller rope.*

Note: Right hand sleeve turned up

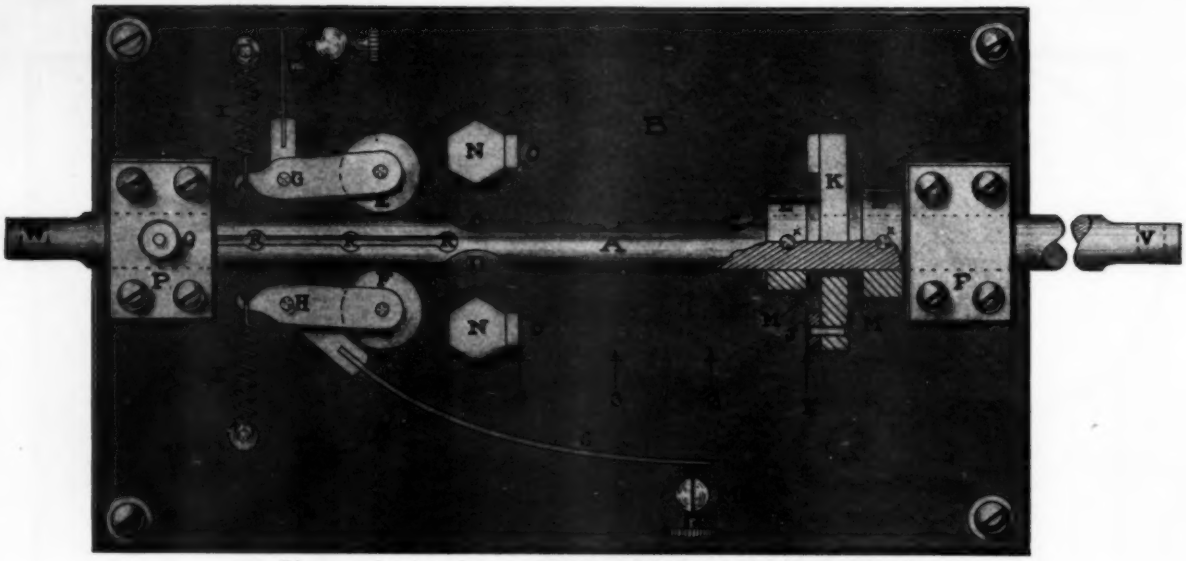


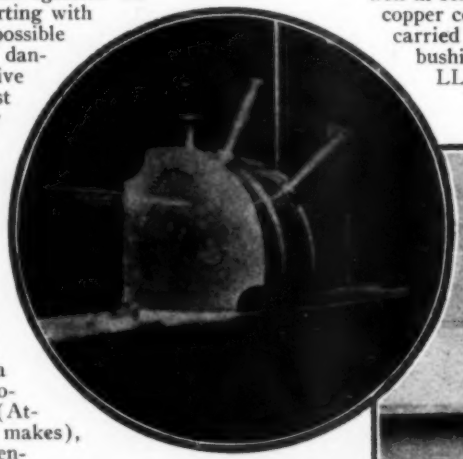
Diagram showing the arrangements of parts of the function switch

The Function Switch

A Device for Controlling All the Functions of Starting, Spark Advance and Ignition on the Marine Engine of the Safe Cruiser

By Frank Pembroke Huckins

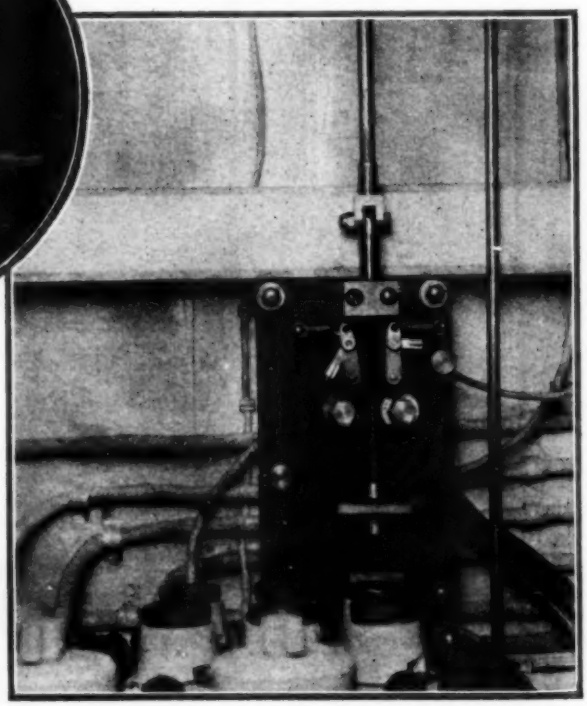
THE Function Switch, for lack of a better name, is a device for controlling all the functions of Starting, Spark Advance and Ignition on one lever. It makes starting with an advanced spark impossible and thus eliminates the dangerous and destructive back kick. The worst landlubber in your party can start the engine if he can but read, for alongside your throttle and in place of the usual spark advance is a lever with four positions marked, *Start, Slow, Cruise,* and *Stop.* The apparatus described was built to use with an engine equipped with a battery distributor automatic spark advance (Atwater-Kent and similar makes), and a separate high tension magneto, which is the usual combination now found on high grade engines.



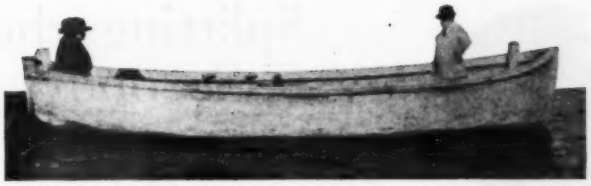
The deck control of the function switch, the throttle control on the right

The Switch itself is shown above and is mounted at some convenient point on the engine-room ceiling. It consists of a slate base about five by eight inches, carrying the brass halved-together bearings P, through which slides a half inch brass shaft A. One end of the shaft W is connected by suitable rods and bell-cranks to the control lever on the bridge, while the other end V may be connected to a lever near at hand for engine-room duplicate control. A keyway is cut in this shaft and four equi-distant holes are spotted, marked R. Tapped into bearing P is a brass tube Q containing a stiff spring and forcing a plunger to bear on the keyway and hold the shaft in one of the four positions. The shaft A is milled or filed out on one side to cover three-quarters of its travel CC, while D is milled out on the other side to coincide with the third quarter only. NN are two hexagon brass studs with heavy copper contacts O O soldered and riveted to their faces, and that run through the slate base for back connection in series with the starting motor circuit. JJ are heavy copper contacts riveted to a brass bar K which is, in turn, carried on the shaft A, but insulated from it by the bushings MM. Its position is secured by the collars LL, held by the taper pins xx.

(*Continued on page* 88)



Looking up at the switch as mounted on the engine room ceiling



Twenty-four foot motor sailer as purchased

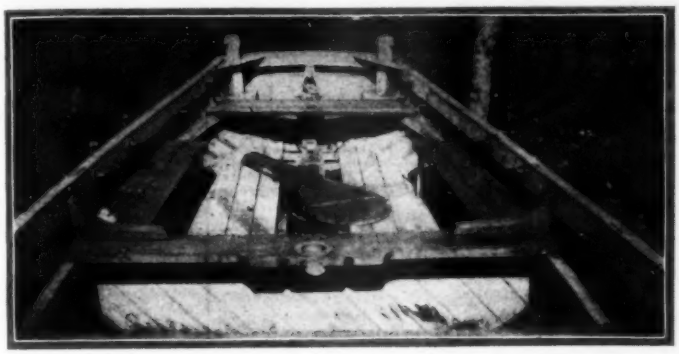
Rebuilding Kawa

How to Convert the Standard 24-Foot Motor Sailer Into a Serviceable Auxiliary

By W. L. Warner

THE Navy Department recently sold a large number of 24-foot motor sailing launches, which are used as tenders on the destroyers. The majority of these boats were absolutely new and can quite easily be altered to suit a variety of uses. The writer bought two of the boats in Norfolk, Va., last fall and at the present time one is being fitted out in accordance with the drawing shown. The work is being done at the yard of Frank Harrison of Essex, Conn., who is also altering a duplicate boat for Frank Couch of Cromwell, Conn.

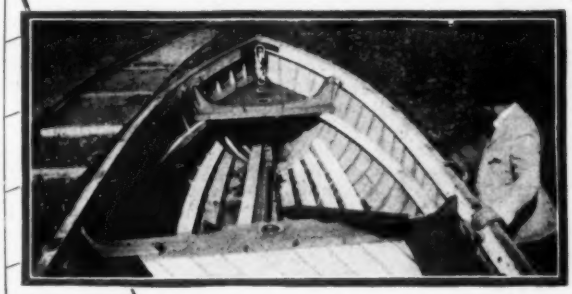
The boats are very heavily built, the framing is of oak and the planking cypress, copper riveted. A diagonally planked water tight bulkhead divides the boat practically at amidships and from this the low trunk cabin runs forward 8 feet. The cabin side and coaming of one piece are fastened to a clamp, which follows the sheer on the inside of the ribs. While this makes a much larger cabin it leaves very little deck space, around the cabin. To overcome this and to protect the hull a 3-inch triangular shaped guard is being put on which will give a total width of 6 inches. The cabin will have two berths and a place forward for a small alcohol stove. The space under the forward deck will be used for storage. The 6-inch crown gives good sitting headroom and with no center board in the way it will be very roomy for a boat of her size. The ventilator and six portholes should furnish plenty of ventilation.



After end of the boat, note the solid construction

The cockpit is fairly large in spite of the room taken up by the engine, and the only drawback is that it can not be made self bailing. It would mean raising the floor entirely too high. The engine to be fitted is a 2-cylinder, 2-cycle, 11 H.P. Hubbard. They are well built, dependable engines, the kind which deliver the goods when wanted. It is very nearly the same size as that used by the Navy and should drive the boat about 8 miles per hour, which is about the hull's most economical speed.

And now for the sailplan, which has been the source of a number of arguments as to the respective merits of the jib headed and gaff headed sails. The question isn't settled yet but it is impossible to get a well balanced sailplan using a gaff headed mainsail, without the use of a bowsprit, so I decided to use the triangular rig. The mast is 5 inches in diameter and 22 feet above deck. The rig shown balances nicely and has an area of 251 sq. ft. The two-masted rig used by the navy had a total area of 302 sq. ft. but it is not as efficient as the rig shown, so that the boats will be as fast as before and certainly much easier to handle. The keel is too narrow to put a center board through so there will be a keel added making a total draft of 3 feet. The plans show one method of altering the boats at small expense to get a cruising auxiliary. To secure a cruising motor boat the mast and added keel could be left off and a very good boat would be obtained. These boats are so heavily built that they could be used for towboats or any proposition, where a small rugged hull is needed. Their model is an evolution worked out by the Navy and found to be the best for ferrying between the ships and shore, in all weather. The name Kawa is probably familiar to readers for who interested in boats has not read the *Cruise of the Kawa*. This Kawa will sail nearer and more conventional waters.



Bow view of the boat before alterations

Outboard profile of the 24-foot motor sailer as altered

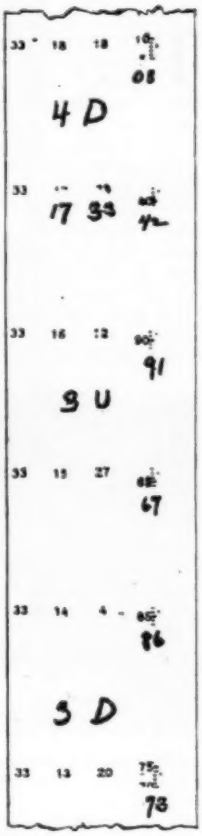
Odis A. Porter operating the timing device at the British International Races at Detroit last fall

Splitting the Seconds

Description of the Electrical Timing Device Which Gives Accurate Results to the 100th Part of a Second

By Odis A. Porter

Chief Timer, Indianapolis Motor Speedway

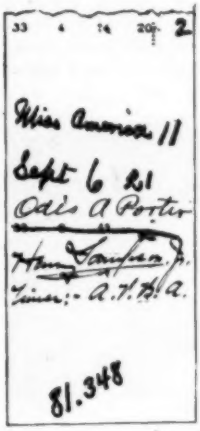


A reproduction of a portion of the actual tape used in the mile trials when Miss America II set up a new world's record at Detroit of 80.56 miles per hour as an average of six one-mile dashes.

To translate (Read from the bottom up) Start of run No. 3 down stream) 33:13:20.73; finish of run No. 3 (down stream) 33:-14:4.86; elapsed time for run 44.13 seconds

ELIMINATING the human equation is the most necessary thing in timing great races.

The more exciting a race becomes, the more this excitement is transmitted to the timers, and at the very moments when absolute accuracy in timing is essential to determine results, occur mistakes which are so liable to destroy the accuracy of the timing.



The signatures testifying to the correctness of the record established on this tape

For over ten years we have been working on a solution of this problem at the World's Greatest Motor Speedway in Indianapolis and have at last evolved a timing device which is practically mechanical in its action and gives unvarying times of every car that crosses the tape down to the one hundredth part of a second in a printed record which can be checked for absolute results.

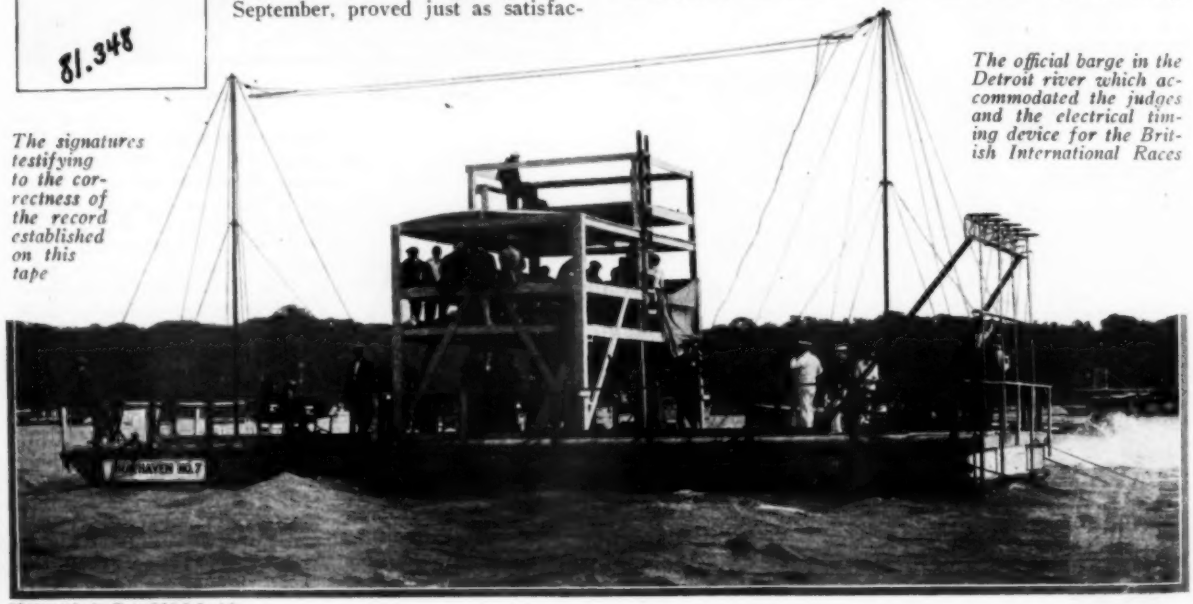
This electrical timing machine which was used with great success in the American Power Boat Association and Harmsworth Trophy Races in Detroit during August and September, proved just as satisfactory in boat racing as it has been demonstrated on the automobile Speedway.

The machine printed the time of every lap, and opposite the time, the number of the boat crossing the line was inserted. When completed, the record on boat No. 3, for instance, read as follows:

00	00	00	00	No. 3
00	00	45	25	No. 3
00	1	30	50	No. 3
00	2	14	60	No. 3

By a very simple subtraction, this shows that the time of boat No. 3 on the first lap was 45 seconds and 25 hundredths. The same time was made on the second lap, and on the third lap the time was 44 seconds and 10 hundredths. The total time for the three laps is read from the tape—2 minutes, 14 seconds and 60 hundredths.

Continuing this record through the race makes it possible to give out results a few minutes after a race is completed, and in all cases of any question an absolute check can be made, giving the time of every boat in the race for every



The official barge in the Detroit river which accommodated the judges and the electrical timing device for the British International Races

Photographs by Rosenfeld & Levick

Orlo III going by on one of her mile trial tests

lap. Chances for mistake are practically impossible, and the judges have an absolute record of every element of the race.

This electrical speedway timing machine is made up of elements procured from the best makers, but has been developed through years of use in racing. From our experience we would not recommend that the promoters of any great race start in to build their own machine, but the Indianapolis Motor Speedway, which owns this device, has been very kind in extending its use toward the timing of other great events, such as the Harmsworth Trophy Races. The machine has been used in automobile racing from coast to coast and has never failed to give absolutely satisfactory results.

This timing machine consists of a small 30-volt motor geared down to run a shaft one-half revolution per second. On this shaft are four disc wheels, namely, hour, minute, second, and hundredths. The hour is numbered from 00 to 59, the minute is numbered from 00 to 60, the second is numbered from 00 to 60, and the hundredth is numbered from 00 to 95 around to the half and the other half from 00 to 95. This wheel is scaled and is secured to the shaft by a small rachet and at the end of shaft is a cross-piece of hardened steel called a govenor, as this shaft will run about 5 hundredths fast, allowing the correction to be made every half second by the aid of a ship chronometer in which is attached to the second wheel a contact that makes and breaks with each second. This contact has 6 volts with a 0.2 MF condenser to take up the spark. This contact operates a relay which makes a contact with two coils of 12 volts, called govenor coils. These coils are mag-

Mr. Porter and Harry Sampson, Jr., looked after the timing. The automatic timing machine, tape, etc., may be seen

Timers at work in the mile trials. Mr. Porter is seen with trap in hand and Gar Wood with the megaphone. Communication with other end of mile was had by means of the telephone connection

netized every second, and operate a bar in such manner as to retard the govenor yoke or cross-piece every second. The other wheels on shaft are free and held in position by three 8-tooth pinions, 4 long and 4 short teeth. As the hundredth wheel makes ½ revolution, this pinion advances the second wheel one number or second, and at every revolution of the second wheel, the other pinion advances the minute wheel one number or minute, and so on with the hour wheel. On top of these wheels a paper tape 2¼ inches in width is automatically fed, and on top of this tape is a printing ribbon which extends across the four timing wheels. Directly above these wheels are four small hammers set into a square frame hinged in the middle, the opposite end being drawn up by two magnets, throwing the hammers down upon the print ribbon, paper, and hour, minute, second and hundredth wheels, thereby getting the impression of the figures on the four timing wheels which

(*Continued on page* 68)

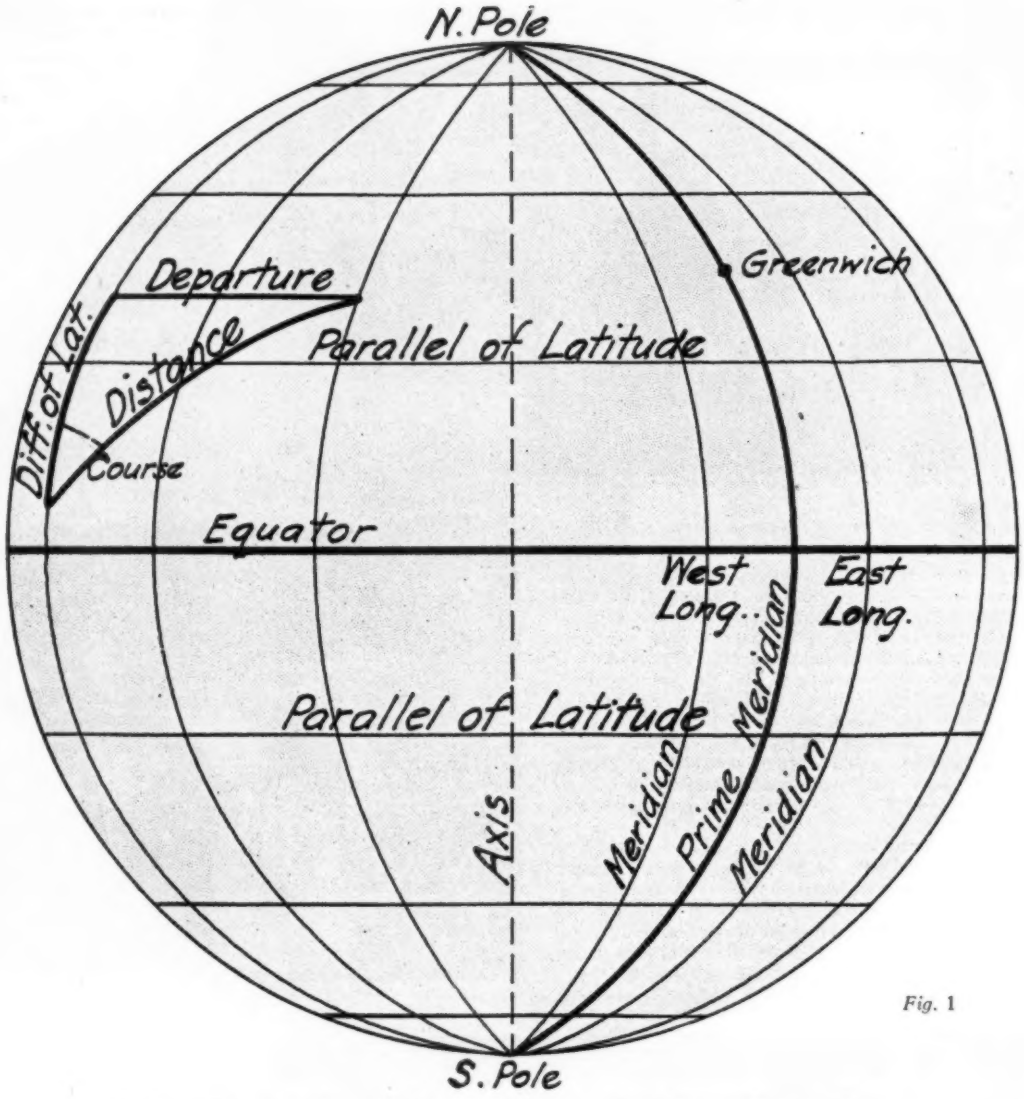


Fig. 1

Navigation By Dead Reckoning

Introduction, Definitions, and an Outline of the General Problems Involved —The First Lesson of a Correspondence Course Which Will Be a Complete Treatise in Simple Terms on This Important Branch of Navigation

By Dean Potter

Chairman, Committee on Instruction, United States Power Squadrons, Inc.

INTRODUCTION

SOME years ago, the writer chanced to hear a discussion between two gentlemen on the subject of navigating inland steamers. One of them, who had a summer place not far from the city, where he kept an excellent launch, was an experienced boatman, though by no means a navigator. The other, his guest, was remarking upon the rare skill of the pilots who take their craft, in all weathers and by day and night, through a narrow and rock bound sound, and according to schedule. "It is all very simple," said the host. "These men know every buoy and lighthouse, every course and distance." "But," said the guest, "suppose there is a fog?" "Ah," replied the host, "then they sail by dead reckoning." The guest was satisfied, though perhaps not enlightened; while the host was happy in the assurance of his own superior knowledge.

But he was wrong; almost as wrong as the young aspirant for an ensign's commission during the war, who defined dead reckoning as "counting up the dead after the battle!"

It is not by dead reckoning that steamers are sailed through narrow sounds in a fog, but by the ordinary methods of piloting: by chart and compass work, using all available aids to navigation, and with especial attention to the sounding lead.

No doubt dead reckoning is unfortunately named, for the name carries small hint of the meaning. How can there be a reckoning which is dead? Perhaps the reference to things departed, arouses conceptions of "Night's Plutonian shores," the River Styx, and things shrouded in darkness and gloom.

Again, how often do we read of some voyage, when the storm bound mariner, unable to take an observation for days, was "compelled to rely on his dead reckoning."

Perhaps it is not unnatural that landsmen, and, indeed, some yachtsmen, have come to the notion that dead reckoning is a method, more or less mystic, of finding one's way

about in the fog, or at night, or during other conditions of low visibility.

But it is nothing of the sort. It is merely the commonplace every day method, constantly employed at sea, of reckoning position from the direction and distance sailed. It has no special reference to sailing during fogs. It is used at such times, to be sure; but also when the weather is fair, and at day, as well as night.

Dead reckoning does not depend upon the state of the weather. Nor does it employ lighthouses, buoys, or other aids to navigation, except, possibly, for fixing the location of the original point of departure; nor does it use fog signals, soundings or other means of locating position by direct reference to the land. For it finds its common use in ocean navigation, where no aids to navigation are visible and soundings are impracticable.

Somewhere is the story that in the ancient log books, mariners had a column for their "deduced reckoning" position. And since to save time is to lengthen life, they came to abbreviate the heading to "ded. reckoning," and this was finally corrupted into "dead reckoning." The story is worth believing, whether it is true or not; for deduced reckoning is precisely what dead reckoning is.

The mariner leaving port takes his departure from some object of known position. Thence he sails various courses and distances. By keeping account of these, he may at any time deduce or reckon his position, approximately. That is dead reckoning, or, as they also used to call it, reckoning by account.

Now there are various ways in which the mariner might perform the operation. He might draw a line on the chart in the direction of his course, and then step off the distance run from his point of departure, and thus get his dead reckoning position. That is dead reckoning by construction. Any one can do it, and if he were a good draftsman, and had decent working conditions, he might make out very well.

But better methods have been devised, methods more quickly and accurately applied, and, with experience, even more easily. Thus, we find the navigator thumbing tables, taking out figures, and then announcing results, all to the astonishment and maze of the uninitiated. In fact, he is merely taking out the tabulated result of various courses and distances, all figured out for him in advance. For, plainly, if a vessel goes a certain distance and direction, it must change its northing or southing and its easting or westing by a certain amount, which will be the same for all vessels traversing a similar track. The epitomes have kindly tabulated the result of all conceivable courses and distances, and the navigator has but to open the book and read the answer! This is dead reckoning by inspection.

Thus the navigator need not each time make the computation. But, if he is to be an artist, he should know how to make it. And this brings us to dead reckoning by computation, which shows the mathematical processes by which the results may be achieved.

And here the student often comes up all standing on the rocks of despair. He finds his epitome full of formulae and tables which he does not understand, and which appear beyond human ken. He does not know that of the forty-six tables in Bowditch, he uses for dead reckoning but five or six, and can get along with three! Nor does he realize that only the simplest elements of plane trigonometry are required for most of the solutions. He is aghast at logarithms, which seem like the devices of mathematical demons. But really they are merely tools which make it easier to multiply and divide long numbers, thus saving the tedious figuring of school-day arithmetic. And the scheme of using them can be gained at a sitting!

No one was ever more appalled than the writer at the seeming impossibility of Bowditch; nor more delightfully surprised at how the difficulties vanished before a modest amount of plain explanation.

Dead reckoning is not hard. But it does require some hard work. Many excellent navigators are men who have had but little schooling, and yet have taught themselves a mastery of the subject.

In these lessons, it will be assumed that the student knows the three R's, and the last one to and including fractions and decimals. It will not be assumed that he knows anything whatever of trigonometry or logarithms. These, as far as necessary, will be explained and illustrated; and, it is hoped, in an understandable fashion. There will be no attempt to be scientific, or to write in the manner of a mathematician. This rather will be avoided, from a somewhat sorrowful recollection that while the precise and elegant methods of the mathematicians are all very well for their ilk, they are oft-times quite over the heads of mortals not similarly gifted. Explanations will be made without sparing words. For the lessons are not intended for class-room use, where an instructor may amplify terse passages. If we say too much, it will do no permanent harm to those who do not need full explanations; and it may save the day for some chap who is trying to grind out a game of solitaire.

It must also be assumed that the student is familiar with the essentials of piloting, particularly the use of charts, the compass, and its correction. Dead reckoning is the branch of navigation which stands between piloting and nautical astronomy. Do not undertake the ocean branches until you have a working knowledge of the inland and coastwise methods. It is well to study anatomy, before essaying to do surgery.

It is often asked whether dead reckoning is of any use to the yachtsman. To the off-shore cruiser, it is indispensable. To the river and harbor man, it is not. The latter will find his reward in a broader knowledge of his favorite sport. It will aid him to be a workman rather than an apprentice. He will incidentally gain a mathematical knowledge of undoubted value in many of his daily pursuits. He may, if he is so created, discover a fascination and pleasure he scarcely dared hope for. And he will lay a foundation for the study of nautical astronomy, the highest art of the navigator, and one of the finest hobbies to which any one ever directed his thought. For dead reckoning is the foundation of nautical astronomy, and the knowledge acquired

THIS is the first lesson in the new Correspondence Course which is to run in MoToR BoatinG, during the next 10 or 12 issues, on the subject of Dead Reckoning. This course will be conducted by Mr. Dean Potter of New York City. We have already received the manuscript for the first few lessons and we can promise our readers that it is going to be the best thing of its kind ever published.

The first few lessons in a Dead Reckoning Course must very necessarily be a complete discussion of certain trigonometrical functions which enter into this subject. However, this mention of trigonometry should not discourage anyone from taking up the course simply because he has not had a college education. Trigonometry and logarithms as they will be applied to Dead Reckoning are not difficult, and can be readily mastered by anyone. It is essential, though, that the first few lessons be studied thoroughly for if the principles set forth in these are well understood all which follow will be easy and the subject of Dead Reckoning will be very simple.

The rules governing the new Correspondence Course will be the same as the last. A new enrolment should be made by sending your name to the Editor of MoToR BoatinG, 119 West 40th Street, New York. Questions will appear in the issue following the one containing the lesson. Answers may be sent any time and they will be submitted to the examiners at the end of the month during which they are received. The names of those who pass by 80% will be published in a subsequent issue of MoToR BoatinG. At the completion of the last lesson all of those who have passed will be awarded an appropriate certificate.

Fig. 3—If the meridians were all parallel a line would cross each at the same angle

for the one is almost an open sesame for the other.

But let no one suppose that he can read these lessons as he might a novel, and thereby master the subject. That is, unless he is already a good mathematician; and for such folk these lessons were not intended. The lessons must be studied. The definitions must be learned; not slavishly or by rote, but understandingly. The tables must be used; the examples must be practised. Do not glance over a solution, and then skip on. Take the problem, and solve it on paper. Turn to the proper table, and pick out each logarithm or function, and go through every step of the process. Then make up problems of your own, with changed elements, and work them out. Work problems and more problems. Thereby only can proficiency be acquired.

And now for a few suggestions:

1. These lessons will explain the methods. But it is impossible to here publish the lengthy mathematical and other tables which must be used. So get a copy of the *American Practical Navigator*, originally by Bowditch, and now published by the United States Hydrographic Office. Get the official government edition. It is far superior to the reprints of private publishers. Avoid like the plague all reduced size editions. They may be convenient to carry, but are death to the eyes. Get the complete volume, both text and tables. It costs but a trifle more than the tables alone, and the text contains material of much interest and value, not alone about dead reckoning, but on all branches of navigation. Every yachtsman should have it. The government edition may be had from any nautical bookdealer, or by sending to the U. S. Hydrographic Office, Washington, D. C. The price for the complete volume is about $1.80.

2. Paste projecting tabs on the first pages of Tables Nos. 1, 2, 3, 42 and 44, and number them. This will save no end of time in opening to the proper part. Preferably, do not put tabs on the other tables, for they simply confuse.

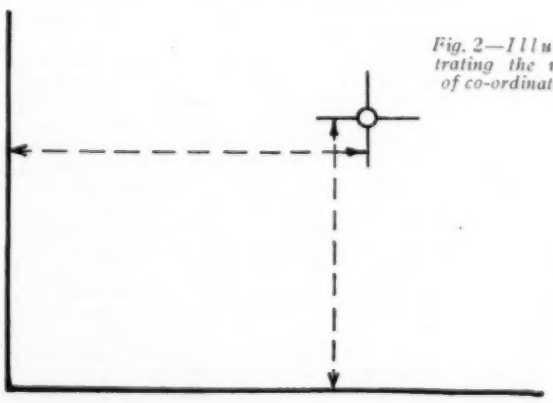


Fig. 2—Illustrating the use of co-ordinates

3. Obtain a letter size loose leaf note book, about 9" x 11", with cross-section paper, and keep your work in it. Do not use a small book. A complete solution sometimes requires a good sized sheet of paper. The cross-section lines facilitate the drawing of right-angled figures.

Acknowledgment is here made of the free use of the definitions and methods appearing in Bowditch, and of valued help obtained from the works on navigation of Muir, Norrie, Raper and Ainsley, and from the excellent text book of the International Correspondence Schools, of Scranton. And an especial obligation is acknowledged to Capt. A. C. Knight and to Commander Sigmund Cohn, of the United States Power Squadrons, Inc., to whom, more than to any one else, the writer is indebted for guidance on his early cruises into this interesting subject.

DEAD RECKONING

Definitions and an Explanation of the General Problem Involved

Dead reckoning is the branch of navigation which treats of the determination of a vessel's position from the course made good and distance covered from a known point of departure.

It includes, also, the determination of the course and distance to be sailed from a given position to reach a desired destination.

The common problems of dead reckoning are two only:

1. Having sailed various directions and distances, the navigator wishes to find his position. The direction or course sailed is found from the compass. The distance sailed is known from the patent log, time and speed of the vessel, or other available means. With this data, course and distance, the navigator reckons or deduces his position, by the methods to be explained.

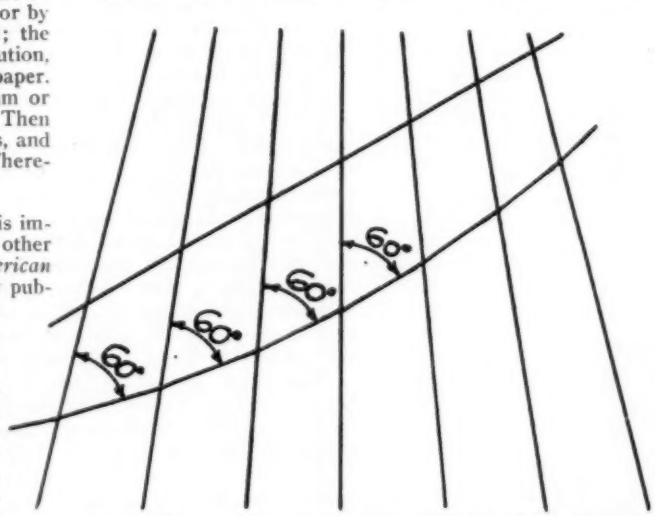


Fig. 4—The meridians converge toward the poles. Thus, the rhumb line, which cuts all the meridians at the same angle, is curved. The great circle track is straight, and cuts each successive meridian at a different angle

2. Desiring to sail from a certain place to a given destination, the navigator must find the direction and distance between them, so that he may know the course to steer and the number of miles he must cover in making the voyage.

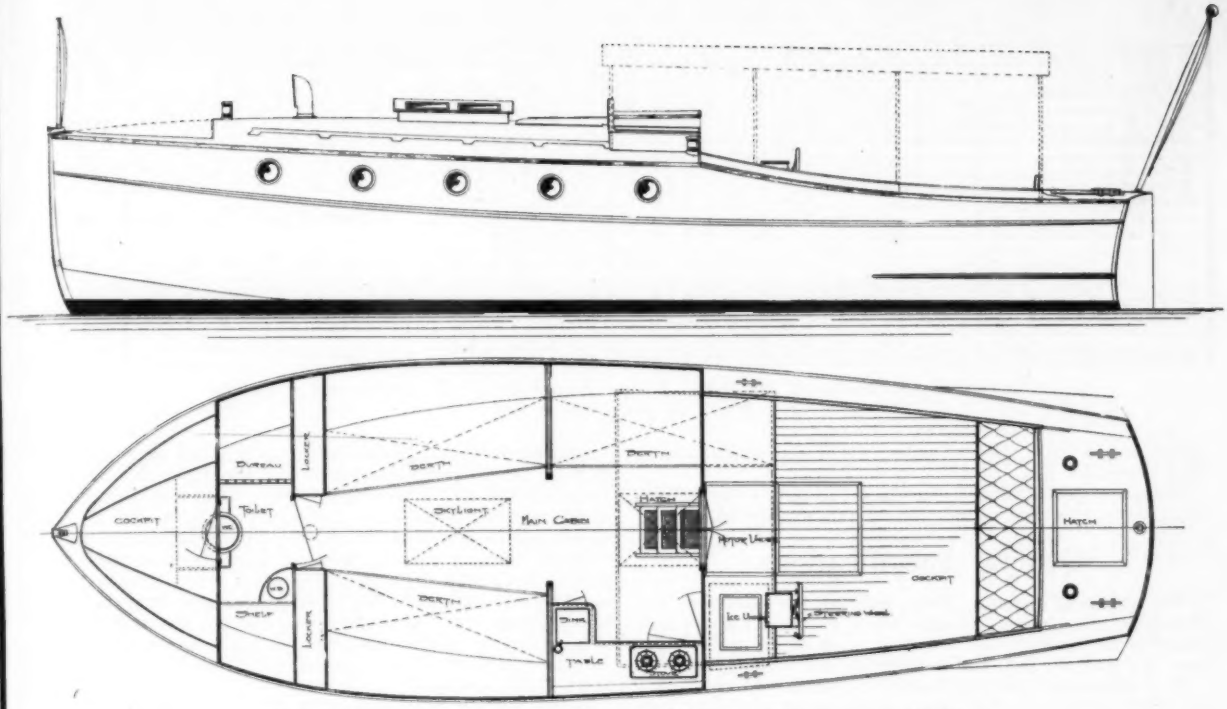
Various terms are employed in dead reckoning which must be thoroughly understood. Some of these will now be defined, and will be found illustrated on the diagrams. See Fig. 1.

The earth is an oblate spheroid, slightly flattened at the poles. But the difference between the polar and the equatorial diameter is so slight, that, for dead reckoning purposes the earth may be considered a sphere.

The imaginary line through the center of the earth, and around which it rotates, is its *axis of rotation*. This axis terminates in points on the surface known as the North and South *poles*.

A *great circle* is a circle formed upon the surface of the

(*Continued on page* 112)



Outboard profile and arrangement plan of the 31-foot Hacker cruiser Margie

Margie, a 31-Foot Hacker Cruiser

An Attractive Cruiser of Moderate Speed Which Can Be Built By Following This Design and Specifications

Designed Exclusively for MoToR BoatinG

By John L. Hacker, N. A.

WITHOUT a question, this first cruiser designed for you in the present series by John L. Hacker, the Detroit naval architect, will interest many. It is of a most substantial type, and designed with a view to cruising comfort at moderate rates of speed. The little 20-horsepower Kermath motor which is specified has ample power and pep to drive the boat at a speed of about 10 m.p.h. For those who are not satisfied with this speed, it can be increased by 3 or 4 m.p.h. by the installation of a more powerful machine, but it will take fully 50 h.p. to gain the additional few miles in speed. The most economical rate for this boat is the one to be secured with the specified motor which will be about 5 miles to the gallon of gasoline.

Much thought has been given to the interior arrangement, and it follows very closely the design which Mr. Hacker worked out several years ago for his own personal use. The forward cockpit has been found in practice to be a very convenient innovation. It affords a very excellent place from which to handle the anchor and lines, as well as furnishing an agreeable position to sit in while the boat is on the way. The lines of the boat are such that water will never break over the top and enter the cockpit, but it is well to provide a canvas cover to keep out rain and fog.

This boat being 31 feet long is probably bigger than can be handled comfortably by the amateur builder. The construction of a boat of this size involves the use of machinery and plant which is beyond the facilities of amateur builder. It is not recommended that its construction be attempted by other than skilled boat builders. Naturally, a man who has built several boats for himself at various times has an idea of the difficulties to be overcome and can tackle the construction of a boat of this size. However, the use of machinery for cutting and finishing all of the material entering into the construction simplifies the work to such an extent that there is no comparison in the relative differences in both cost and labor expended.

THE first cruiser to be designed for you by John L. Hacker, the famous Detroit naval architect, is presented herewith, While only 31-feet long and designed to be powered with a moderate size motor, ample speeds will be secured. An installation up to 50 h.p. will produce a speed of about 14 m.p.h. while the smaller motor specified will yield 10 m.p.h. at a very economical rate of fuel consumption. Some very clever features in the interior arrangement give the boat the accommodations of a much larger craft and for all around cruising, fishing, etc., it will be hard to find a more suitable design.

The interior arrangement is very compact. At the extreme bow will be found a toilet room with dressers and wash basin. The main cabin is provided with two berths on the starboard side and one on the port side. Hanging lockers for clothing and a buffet cabinet are at the forward end. The after starboard berth is designed to extend under the bridge deck in the cockpit so as to get the necessary length. A galley which is very compact is on the port side. A sink, an abundance of locker space, a table for the stove, and the refrigerator door are all close at hand.

In the center under the companionway stairs, the motor is placed and is accessible both from the cabin and from the hatch in the cockpit. The floor of the cockpit is raised sufficiently above the water line so that it is self-bailing. A comfortable lazy-back seat extends the full width of the cockpit at the after end. The short after deck encloses the hull and contains the fuel tanks, storage space, tiller quadrant, and similar items.

For those who desire blue prints of these drawings to a scale of one inch to the foot, arrangements have been made whereby these can be secured at moderate cost by

STATIONS	0	1	2	3	4	5	6	7	8	9	10	CURVED LENGTH
KEEL		1-1-3	0-10-1	0-8-6	STRAIGHT-TO					0-0-6		
RABBETT-LINE		1-3-5	1-0-3	0-11-2	0-11-4	1-0-5	1-2-3	1-4-2	1-6-3	1-8-7	1-11-6	
CHINE	3-11-3	3-4-1	2-11-4	2-8-0	2-5-6	2-4-4	2-3-6	2-3-3	2-3-2	2-3-3	2-3-4	
SHEER	6-3-0	6-2-1	5-10-3	5-7-3	5-5-0	5-3-2	5-2-0	5-1-3	5-1-0	5-0-7	5-1-0	
RAISED-SHEAR	7-3-2	7-5-1	7-3-0	7-1-1	6-11-3	6-10-0	6-7-6	6-1-2	5-9-5	5-8-1	5-8-0	
					HALF-BREADTHS							
CHINE		1-9-5	2-9-2	3-4-7	3-5-0	3-10-4	3-10-5	3-9-4	3-7-7	3-5-4	3-2-3	3-5-0
SHEER		3-5-0	4-4-6	4-9-3	4-9-0	4-8-3	4-6-4	4-2-6	3-10-7	3-5-4	2-10-1	3-1-1
WATER-LINE - NO. 1			0-4-2	0-7-3	0-8-7	0-8-0	0-4-1					
" " " 2		0-3-5	0-8-7	1-2-1	1-5-4	1-6-5	1-5-6	STRAIGHT-LINE-FROM-KEEL-TO-CHINE				
" " " 3		0-6-4	1-1-7	1-9-3	2-3-4	2-6-7	2-7-5					
" " " 4		0-9-4	1-7-4	2-5-6	3-2-0	3-7-4	3-9-0					
" " " 5		1-0-6	2-1-4	3-2-0	3-9-2	3-11-3	3-11-6	3-11-0	3-9-6	3-7-6	3-4-6	3-8-0
" " " 6		1-3-6	2-10-3	3-6-4	3-10-7	4-1-0	4-1-4	4-1-1	3-11-7½	3-10-2	3-7-3	3-11-1
" " " 7		1-11-6	3-11-7	3-7-6	3-11-7	4-2-0	4-2-4	4-1-7	4-0-3½	3-10-1	3-6-7	3-10-7
" " " 8		2-1-3	3-1-4	3-9-1	4-0-7	4-2-7	4-3-2	4-2-1	3-11-7	3-8-4	3-4-0	3-7-6
" " " 9		2-3-2	3-3-4	3-10-7	4-2-1	4-4-0	4-4-0	4-2-3	3-11-0	3-5-7	2-10-7	3-2-2
" " " 10		2-6-0	3-6-5	4-2-0	4-4-5	4-6-0	4-5-1					
DIMENSIONS-IN-FEET-INCHES-EIGHTHS-HALVES-TO-OUTSIDE-OF-PLANKING-FROM-BASE-LINE												

Table of offsets for Margie, the 31-foot Hacker cruiser giving all necessary dimensions for laying out the complete boat

addressing F. W. Horenburger, 63 West 184th Street, New York, N. Y.

Complete specifications covering every item entering into the construction and completion of this cruiser follow:

General Specifications

The principal general dimensions of the boat will be: overall length, 31 feet; overall beam, 9 feet 6 inches; free board at the stem, 5 feet 2 inches; free board at the transom, 3 feet 3 inches, and a draft of 2 feet 8 inches.

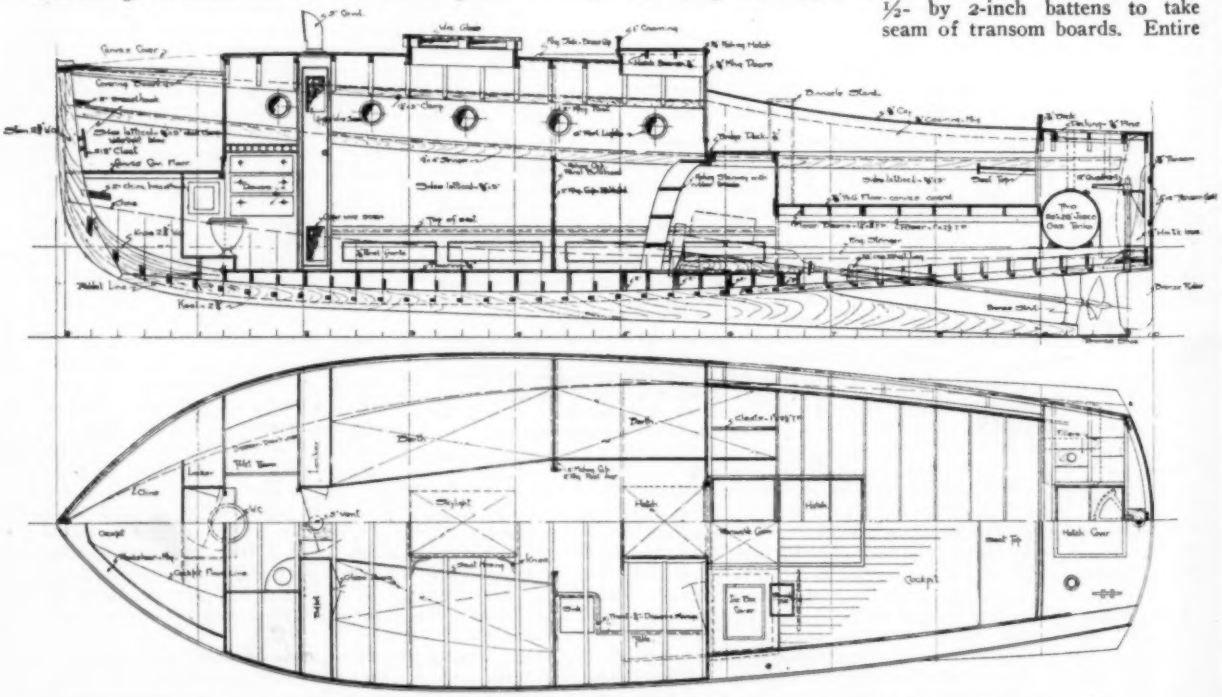
It is understood that all materials that are to enter into the construction of this vessel shall be of the very best grades for the purposes intended. All workmanship shall be first class, and all work executed in a workman-like manner. Builder shall lay out boat in full size, and no deviation is to be made in lines, or otherwise, without full consent of owner or architect in writing. These specifications are intended to cover a complete job, and anything mentioned in specifications and not shown on plans, or vice-versa, shall be considered a part of the contract and shall be furnished by builder.

Construction

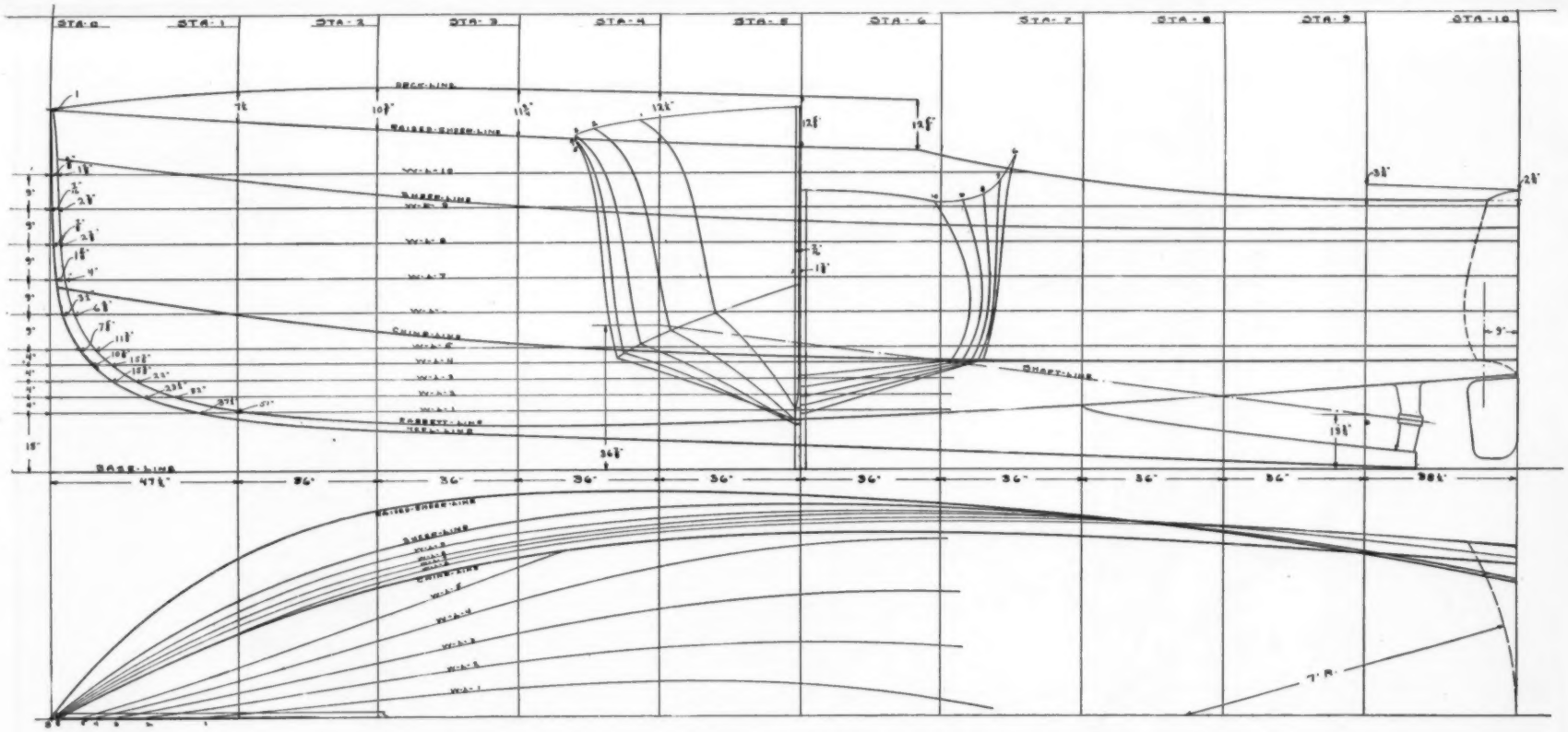
Keel: To be sided 2¾ inches and shaped as per plan, to be of sound white oak and in one piece. A cheek piece of 1⅛-inch white oak is to be fastened on each side, the bottom edge of which will form the bearding line. It is to be fastened every 6 inches with ¼-inch rod over washers. It is to be properly beveled to suit the form of hull, and then notched to receive the frames. These cheek pieces are to extend to the horn timber. This horn timber is to be shaped from a piece of 2¾- by 5-inch white oak, which is to be checked over the keel as shown on the plans and properly rabetted through to the stern. The keel is to be notched out to receive the bent frames and drift fastened with ⅜-inch rod. If a single piece is not procurable, then a joint can be made with a scarph not less than 2 feet in length, which is to be fastened with four 7/16-inch drift bolts.

Stem and Knee: Stem to be of white oak of 2¾-inch stock and shaped as per plan. Knee to be preferably of hackmatack of same thickness and fitted and through bolted to stem with four 7/16-inch bolts. To be properly beveled and rabetted to suit planking, and bolted in a like manner to keel, and the rabetting finished. To have pine stop-waters where necessary.

Transom and Frame: To have 1½- by 5-inch stern post, to be supported to keel with a 1¼-inch hackmatack knee on each side, fastening to keel with screws. Upper and lower member to be sawed to proper radius from white oak, these are to be halved into stern post. Side members to be of white oak of 1¼-inch stock, also upper and lower. To be cut to proper shape and halved into upper and lower member. To have three ¾- by 2-inch cleats on each side extending from upper to lower member, then to have two ½- by 2-inch battens to take seam of transom boards. Entire



Inboard construction profile above with half deck and half beam plans at cockpit level below



An essential drawing for boat building. Lines of the **31***-foot Hacker cruiser Margie*

frame to be of white oak, and all screw fastened. To be properly beveled and trimmed and covered with ¾-inch mahogany. To be screw fastened and holes wood plugged. To have filler on upper member to form proper deck crown.

Chines: To consist of an inner member to be properly shaped and beveled from 2- by 6-inch yellow pine or fir, with an outer member shaped from 1½- by 3-inch white oak. Inner member to be slightly hollowed to take bend of frames and tapered to stem and stern. To be fastened to stem and 3-inch breast with screws. Also, to have a substantial knee on each side of transom frame. Outside chine to be through rivet fastened to inner member with 3-inch copper wire nails riveted over burrs, every 6 inches.

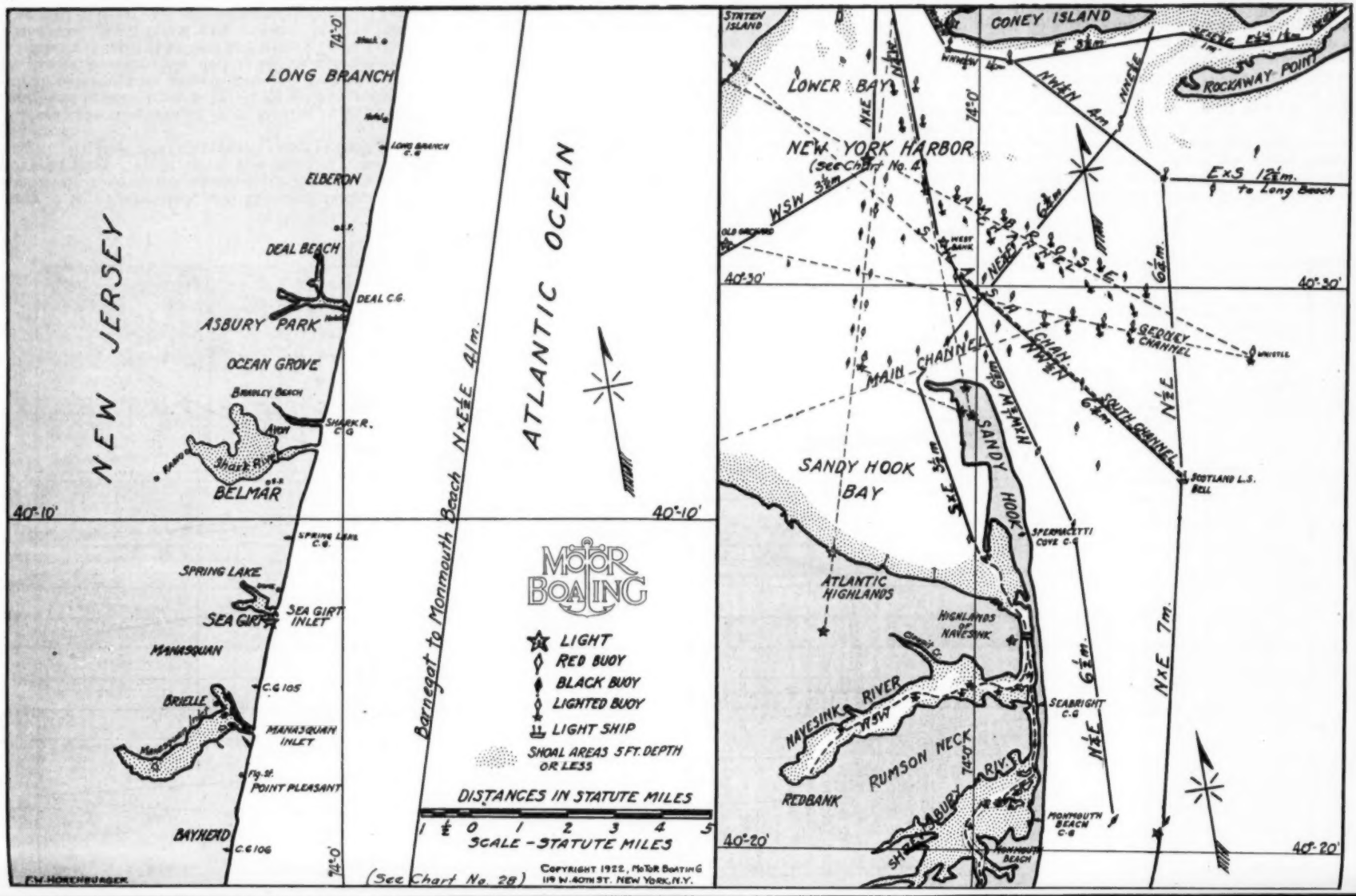
Clamps: Top clamp to be 1¼ by 3 inches, to be of white oak or yellow pine, and to have two rivet fastenings into each frame, using 3-inch copper wire nails. To be re-enforced at stem with a substantial oak breast hook. Sheer clamp to be of 1½- by 4-inch yellow pine and fastened in a like manner as top clamp. Clamps to be in one length and slightly tapered to stem. Top clamp to be placed so that deck beams will rest on same.

Frames: To be of 1- by 1½-inch white oak of select bending stock. To be boxed into cheeks and extend to sheer. To be rivet fastened to chine with two 3½-inch copper wire nails riveted over burrs and screw fastened to clamps with galvanized screws. To be tied across keel with an oak floor tie, of such size as indicated on plan, alternating with ⅞-inch and 1¼-inch aft to engine bed, then 1-inch from such point, aft to stern. If this method is to be used, the forms should be made substantial, and bottom and sides well battened with 1¼- by 2-inch battens, securely fastened into place, then removed as planking progresses. Note: for the individual who will build his own boat, the following system may be used and may be desirable. Form all station frames from 1¼-inch white oak, making a side and bottom member. These should be 4 inches deep on bottom and 4 inches at heel, tapering to 3½ inches at top. These to be halved at chine and then tied with a 1½-inch oak floor, to be through bolted to keel. Then to have ¾- by 2-inch plank stringers on sides, spaced approximately on 6-inch centers and ⅞ by 2 inches on bottom. These are to be let in flush with frames and securely screw fastened to frames. After planking is finished, to have two ¾- by 1½-inch bent oak frames, to extend from keel to top and tied across keel with an oak floor of same thickness and through bolted to keel. The former system is recommended and will allow more cabin room.

(*Continued on page* 102)

Motor Boatmen's Chart No. 29, New Jersey Coast—Bay Head to New York Harbor

For Use in Connection with Coast and Geodetic Survey Charts Nos. 543, 1215, 1216



Finding One's Way At Sea

Celestial Observation is Simpler Than Dead Reckoning and May Be Practised by Anyone Who Can Add Two and Two—Methods Followed on Hippocampus Between New York and Panama

By Alfred F. Loomis

A PRINTER'S error in the working of a St. Hilaire sight in the November issue elicited so much navigational comment that I have been asked to make a few remarks on the subject of finding one's way about by aid of the sun, moon, and stars. It appears that many boat owners, like myself, are interested in navigation, and, also like myself, wonder how it is done on a small boat. If I had not been gifted in birth with a pair of unusually flexible, not to say prehensile, shoulder blades, I doubt if I should ever have become a competent navigator, for it is with these little appreciated portions of the anatomy that one tries to hold on while using the sextant.

Nevertheless, and for the sake of destroying any undeserved prestige which the cruise of Hippocampus to Panama may have given me, I should like to confess that celestial navigation is absurdly easy. It is easier than dead reckoning; twice as easy as cooking chow in a seaway, and a thousand times simpler than thinking up legitimate deductions from a Federal income tax. It is merely a matter of adding, subtracting, and interpolating, plus the retention in the memory of a few definitions and formulae.

As a child, I had such a head for mathematics that I left school when a trigonometry book was placed in my flaccid hand. I knew arithmetic, however, and when my father mentioned a position with a publishing house as an alternative to further schooling I took the job—at $4 a week. The years passed, and when in 1917 I entered the Navy I thought that mathematical genius might be latent in me. I bought a copy of Wentworth's trigonometry, but on opening the book I was disillusioned. I couldn't find out then, and I don't know now, what it is all about. I don't know a sine from a cosecant, and the only logs I understand are taffrail logs. But I can navigate—and in proof of that, Hippocampus lies to a mooring in Panama, where I put her.

So can anybody else navigate—and for proof of that, one has only to go on board a tramp steamer and look at the framed certificates on the chart-house bulkheads. Navigation is not the exact science that many land-going professors would have us believe it to be. If it were, innumerable engraved certificates would be taken out of their frames, and hundreds of ships which now ply the ocean lanes would be bleaching their bones on rocky reefs. Thanks to the visibility of objects above the sea, and more particularly, to the established aids to navigation on dangerous headlands and over treacherous shoals, there is a permissible latitude in the practice of the science.

It is sometimes a difficult task to use a sextant on a small boat at sea

These remarks are not for the purpose of decrying the ability of navigators in the merchant service, but to give heart to the amateur who is worried by the seeming complexity of the subject. The only way to navigate is to navigate—and that is literal truth. I would not say that the only way to play the saxophone is to play it—but the arts differ.

Practice in the arithmetical part of navigation is, of course, essential, but practice will not make the navigator perfect. As long as one is practising ashore, working sample sights, the subject is as invigorating as the totting up of another man's profits in a mercantile house. And the one occupation is about as useful as the other in attaining ability to determine one's position at sea. Experience makes the perfect navigator, but that experience can be gained only in the actual finding of one's position.

Many beginners must have given up navigation in despair because, in shore practice, it does seem so mechanical and uninspiring. But if they will renew their enthusiasm, put to sea with their own or borrowed instruments, and experiment until they can ascertain their whereabouts by celestial means, they will feel the inspiration of navigation. They will enjoy one of the most satisfactory thrills of their existence when they make their first perfect landfall by this medium.

Self-confidence is equally important with experience, and belief in one's own ability cannot come if there is another man on board to whom to turn for advice and correction.

The beginner must go it alone after he has mastered the technique of navigating. But to gain self-confidence, one must first of all be sure that the sights he takes are correct.

This assurance is best gained by taking simultaneous sights with a competent navigator and comparing the angles of the two sextants. If, in a series of sights, the beginner's angle is consistently more or less than the expert's, it is evident that he does not fully understand the use of the sextant, or that he is afflicted with an optical error. Time and experiment will correct either failing. If only one sextant is available, the beginner may alternate taking sights with an expert at equal intervals of time. In either event, he must find and correct any personal error, because accuracy in taking sights and infallibility in reading the vernier are the prime essentials of navigating.

Granting the ability of the motor boatman to use the sextant correctly, the question arises of what he has to know in order to be a navigator. I believe that he need be acquainted with the use of only five formulae, and that, although it is desirable it is not essential, he understand why these formulae give him the desired results.

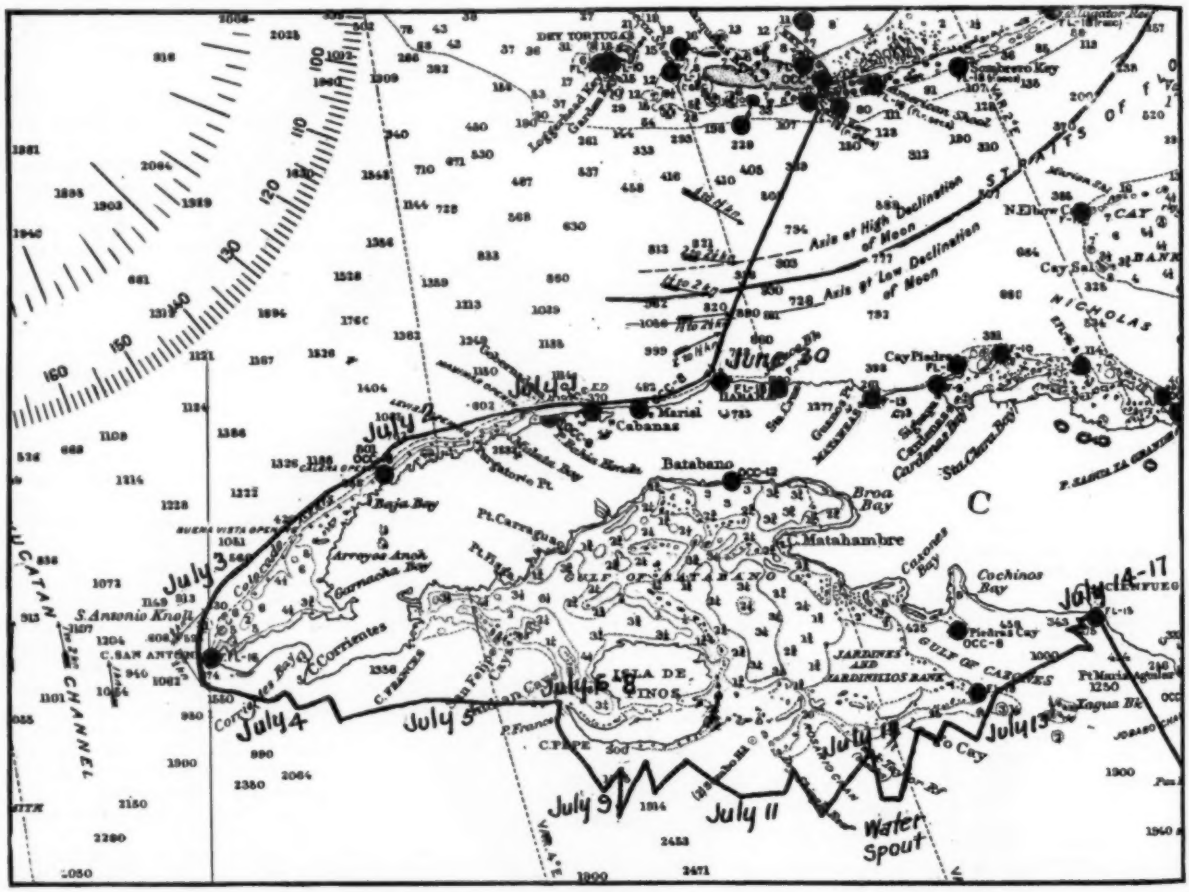
At the top of the list comes the extremely simple form for finding latitude from a meridian altitude, or noon sight. In northern latitudes in summer it consists only of adding 90 degrees to the declination of the sun and subtracting the corrected altitude in order to obtain the latitude. It is often more satisfactory, however, to assume a dead reckoning longitude, and from it forecast the exact time of the meridian transit. The sight is then taken at the calculated second of noon, and the observer is saved the trouble of waiting for the sun to rise to its zenith and dip.

Follows an example of the method of finding Greenwich Mean Time of Local Apparent Noon:

LAT	24	00	00	
Long +	1	25	20	W
GAT	1	25	20	
Eq. t. +		6	13	
GMT of LAN	1	31	33	
CC —		1	47	
CT of LAN	1	29	46	

Since, in this formula, we are reversing the usual process of converting chronometer time to apparent time, all signs are reversed. That is, west longitude is added, equation of time is changed from minus to plus, and a slow chronometer correction is subtracted. The resulting figure, 1h 29m 46s, is the chronometer reading at the moment for taking the sight.

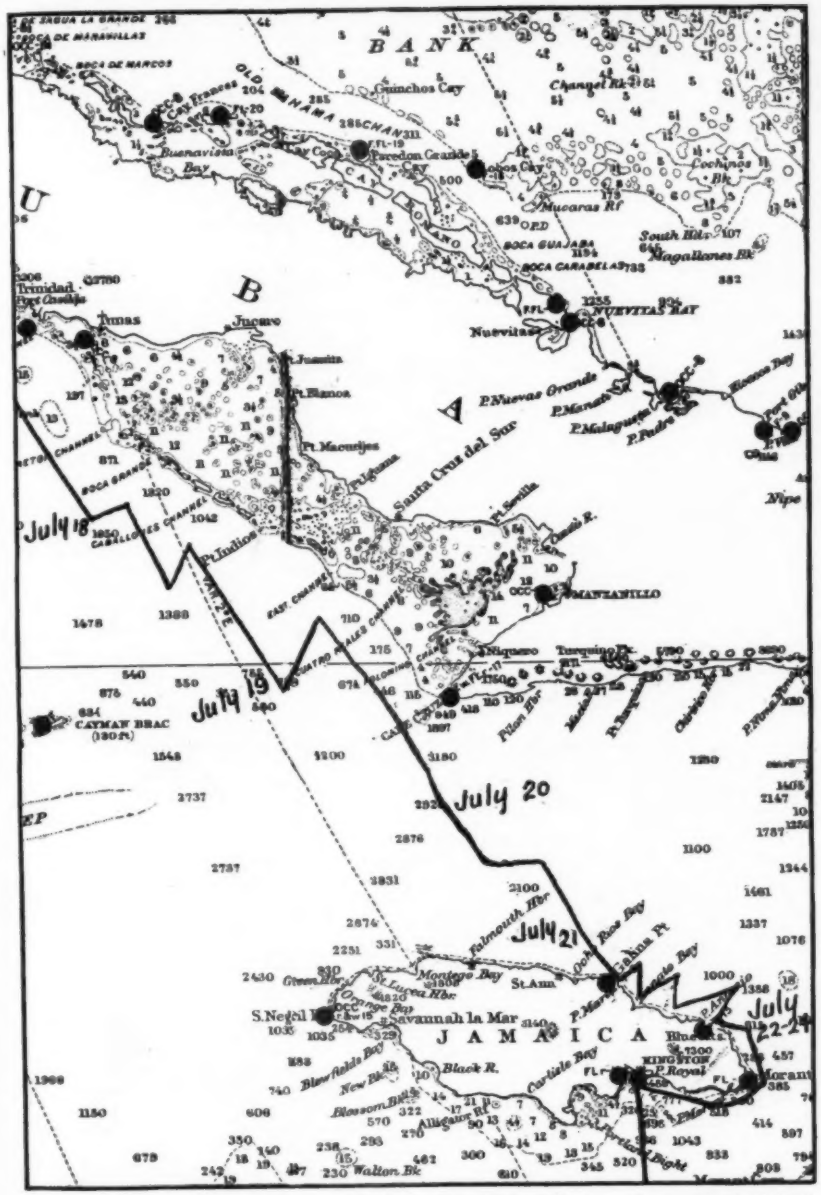
Another method which the amateur mariner will find useful is that of determining latitude from ex-meridian sights—that is, from sights taken a few minutes before or after noon. There is not space here to explain the process. If the reader does not already know it, he will do well to look it up, as the method is of great value on cloudy days when the sun is liable to be obscured at noon. On the Caribbean part of Hippocampus' cruise I was unable to employ it, for it has the shortcoming of being unworkable when latitude and declination are about the same.



The track of Hippocampus from the tip of Florida to Cuba and around the westerly end of the island to Cienfuegos

Third on my list—although not in order of importance—comes the well-known time sight. The boatman who learns it may say to inquirers, "Yes, I know the time sight, but I know better than to use it."

Fourth comes the azimuth method of finding deviation of the compass, of which the following example is given:



Courses followed in crossing the Caribbean Sea from Cuba to and around the Island of Jamaica

CT	8	11	32
CC +			38
GMT	8	12	10
Eq.t. +		2	56.7
GAT	8	15	06.7
Long +		30	36 E
LAT	8	45	42.7

Obs. azimuth ☉ 108°
True azimuth 98°
Error 10° W
Variation 9° 30' W
Deviation 30' W

Position: Lat. 37° 40' N
Long. 7° 39' E
Declination: 21° 28' 35" N
Ship's head: 272°

CT	9	12	40
CC +		19	34
GMT	9	32	14
Eq. t —		5	03.4
GAT	9	27	10.6
Lo. W —	5	11	28
LAT	4	15	42.6

Z 281°
Line runs 191°

The sun's bearing is observed through sight vanes on the compass (or by pelorus) on a given heading, its true bearing or azimuth is found in the Azimuth Tables for the moment of observation, and the difference between the two, when variation has been eliminated, is the deviation of the compass on that heading. It is advisable to obtain an azimuth whenever a new course is set.

In my list, the fifth and most important navigational method in the St. Hilaire, which may be used for everything except slushing the mast. Exact longitude is obtainable in one sight by this method when the sun is taken on the prime vertical—when it bears due east or west. A fix is possible in two morning or two afternoon sights of the sun in northern latitudes, or one of each, and by night by sights of two stars taken at nearly the same instant. The St. Hilaire method may also be used without change with the moon and the planets as well. Thus, it will be seen that it is almost universal. If phi prime sights, time sights, and even meridian altitude sights are all forgotten, the navigator may still get along successfully with the St. Hilaire method.

Many amateurs believe that this method is beyond them, being influenced, no doubt, by the adherence of old school merchant sailors to the archaic time sight. I repeat that it is simple. I may not know why I add the log haversine of the hour angle to the log cosines of latitude and declination and by various processes find that I have calculated the altitude of the sun at the exact spot on the earth's surface where I suppose I am. I know that I do attain this result, and I know, too, that in ten minutes from the time of taking up my sextant for the second sight of a pair of St. Hilaire sights, I can dot my position on the chart.

Let us take a sight from Hippocampus' notebook, which is correct in every detail, and analyze it step by step in informal fashion to show that there is nothing incomprehensible about the St. Hilaire method. The mathematicians among MoToR BoatinG's readers are asked to be patient.

August 11, 1921, 4:15 P. M.

Caribbean Sea—on board Hippocampus, en route to Colon, Panama.

Position by DR: Lat 13° 19' N
Long 77° 52' W
Height of eye, 8 feet
Dec. 15° 14' 49" N

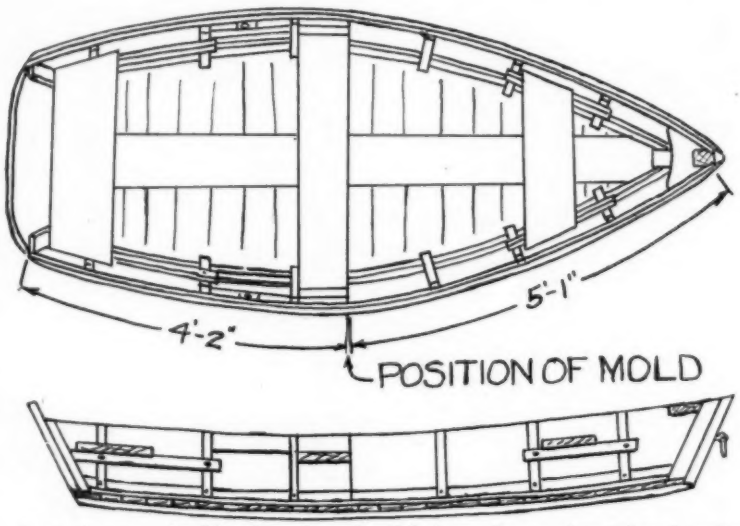
				°	′	″
	Obs. alt. ☉			28	04	00
	I C —				01	00
	Comb. Corr +				11	22
	h			28	14	22
		°	′	″		
t		4	15	42.6	log hav.	9.44754
L		13	19		log cos.	9.98816
d		15	14	49	log cos.	9.98444
					log hav. θ	9.42014
					nat hav.	.26313
L~d		1	55	49	nat hav.	.00028
z		61	45	32	nat hav.	.26341
		(90	00	00)		
		(—61	45	32)		
Cal h		28	14	28		
Obs h		28	14	22		

Int. 06″ away.

(*Continued on page 92*)

Anybody's Dink

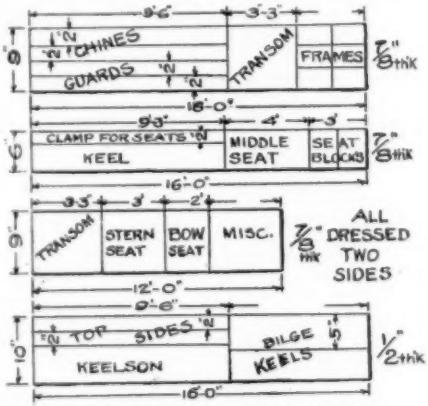
A Simple Little Design Arranged to Be Easily Built By Anybody Who Possesses a Few Tools and a Bit of Ambition



Looking down into the dink from above and an inboard profile

EVERY motor boat enthusiast should at some time build a boat. It will furnish him wholesome, interesting exercise, and at the same time teach him to value and judge good boat building. While it is impossible for most of us to build a boat of any size, owing to space limitations around the average home, many of us can find space to build something small, like a dink, either in cellar, spare room, woodshed, or garage. A dink is a handy article to have around, even if not a part of a larger boat's equipment.

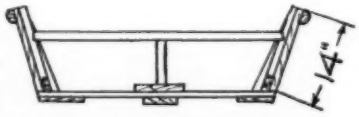
Last winter, I built a dink in the cellar, which was fairly well heated by the furnace, and where a little dirt did not matter. She is 9 feet long, 3 feet 4 inches beam, 14 inches high in the sides, and is a dead rise or flattie. Being the first complete boat I had ever attempted, I chose yellow pine as the material to keep the cost down in case anything went wrong. However, I had wonderful luck, and was surprised at the ease and speed with which I produced the finished boat.

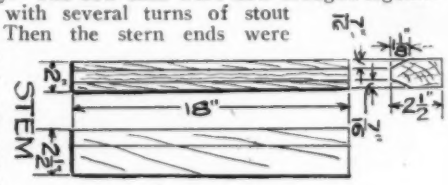


Economical cutting of material, in addition two pieces of 12-foot by 12-inch by ½-inch thick will be needed for sides

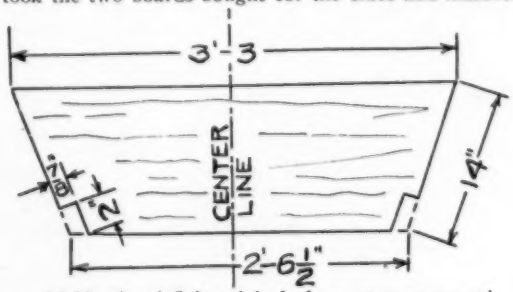
I began with the stem of 2- by 3-inch Georgia pine, about 18 inches long, and beveled the two edges as shown, using a sharp hatchet and finishing with a plane. Next, the mold for the midship section was gotten out from a rough board. This done, I took the two boards bought for the sides and matched them to get the grain as nearly as possible the same in both planks, so that when bent, they would take nearly the same curve. The bevel, which was to determine the rake of the bow, was now laid off on both planks, and sawed off.

This done, I placed the stem, the two side planks, and the mold in position on the floor. The position of the mold was located by measuring along the sides from the forward ends, and the sides were tacked to the mold with 8-penny wire nails, with the heads left protruding for easy pulling when finished. Three nails to a side are plenty. The bow ends were now brought together and secured with several turns of stout clothesline. Then the stern ends were drawn into their approximate shape. I did this work alone, but a friend would come in handy here, as the planks have a powerful spring and would do some damage to the person if they got loose. Use plenty of line for this. When this is finished, the reason for leaving the planks 3 feet longer than necessary will be apparent. The stem was now fitted into the bow, and it required a little addi-

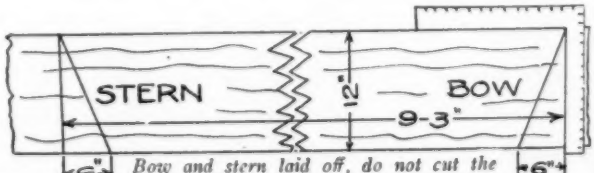




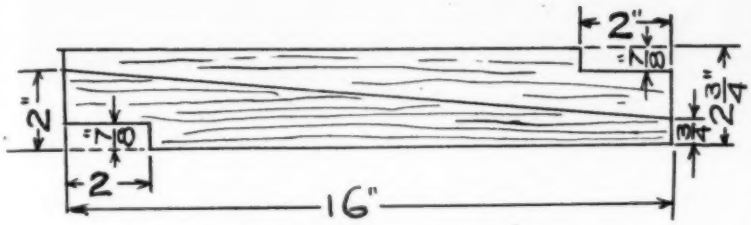
Detail of the stem



Mold, placed 5-feet 1-inch from stem measured along the side



Bow and stern laid off, do not cut the stern until after the transom is in place



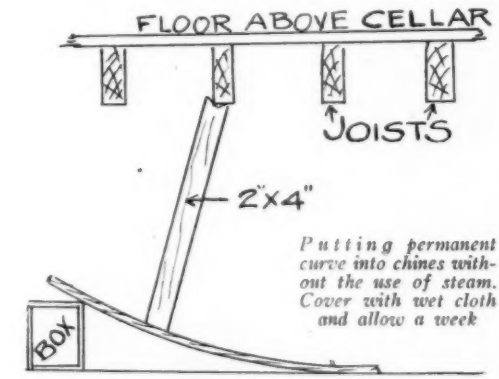
Pair of side frames ready to cut

tional planking to make it fit properly. One side plank, then the other, was nailed to it, keeping the inside edge of the plank fair with the forward edge of the stem. Something faintly resembling a boat had appeared.

For convenience, the entire assembly was now lifted up onto trestles, and the stern ends of the planks were drawn closer together. One of the planks had bent more than the other, but I corrected this by wetting the straighter and stiffer plank at intervals, and by the next day it had bent enough to match the curve of its mate.

Measurements were taken for the transom, across the top of the planks, across the bottom, and the slant height at the sides. From a vertical center line I laid out the pieces of ⅞-inch pine for the transom itself, and fitted one 9-inch piece in place at a time, although the whole transom might well have been battened together and fitted in as one piece. The necessary beveling was done a little at a time until a good fit was had.

The chines came next. They were ripped out 2 by ⅞ inches, and long enough by actual measurement to reach from stem to stern, along the sides. The forward ends require the most work, as they must be fitted to the stem. As these pieces were rather stiff, it was necessary to soak them with water, and bend them to an approximate curve while wet. This was done by propping one end on a box and wedging a piece of 2 by 4 inches between their middles and the joists of the floor above. They were kept damp for several days by means of wet rags wrapped around them. When they had set to a likely curve they were fitted in place, beginning at the stem and clamped in position with several cheap little C clamps. Clinched nails at intervals of 6 inches secured them to the planks.

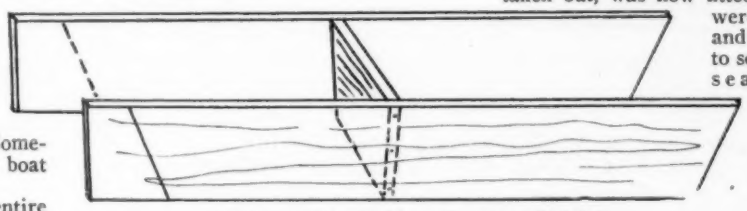


Putting permanent curve into chines without the use of steam. Cover with wet cloth and allow a week

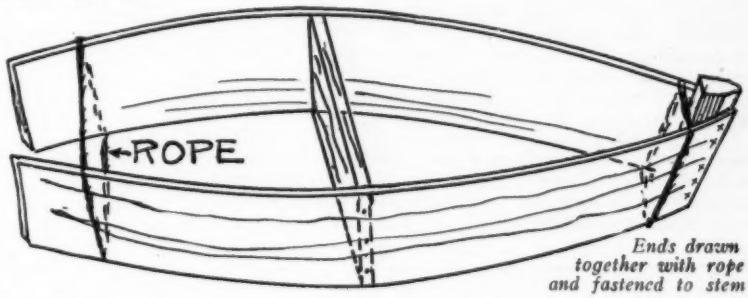
Frame fitted to chine

Battens were now fitted to the transom to further secure the sides to the stern. They were clinch nailed to the transom, and partly nailed and partly screw fastened to the sides.

The side frames followed next, being placed where it seemed they would do the most good. They were nailed first to the chine from the outside with the nail driven into a partly bored hole, and from the outside and clinched in both cases. The middle seat or thwart, which was to hold the boat in shape after the mold was taken out, was now fitted in. Both ends were notched into and screw fastened to seat blocks. These seat blocks were slightly rounded on the inside to make them fit snug to the sides. They are clinch nailed to the sides, top and bottom. The mold was now of no further use, so it was knocked out. It should be mentioned that the seat blocks were left long enough to allow for the two-inch



First assembly of sides. Do not nail tightly

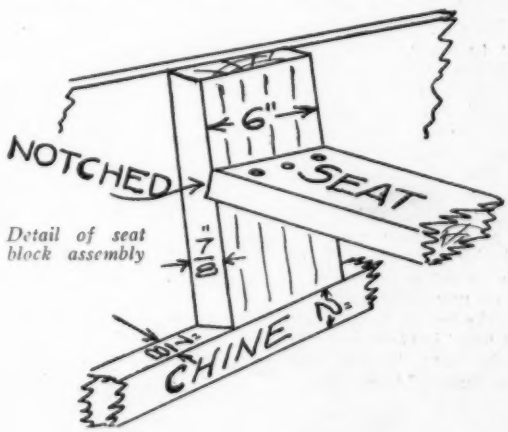


Ends drawn together with rope and fastened to stem

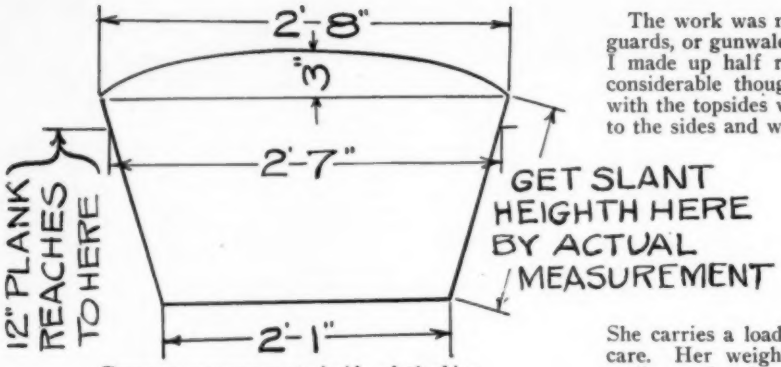
strips which were attached to raise the sides to 14 inches. These were nailed to the stem, frames, seat blocks, and transom.

The rapidly growing boat was now turned bottom up so that the chines might be planed fair to receive the bottom, a straight edge serving as a guide. This should not be hurried, as the fairness of this joint will determine the tightness of the boat. To insure good towing qualities, I cut a wedge from the chine, beginning with nothing amidships and running to a half inch at the stern. This tends to make the bow lift when towing.

The bottom planks should extend a bit to allow them to be planed fair with the sides. The bottom on, and planed nicely all around, the boat was again turned over, this time right side up, so that the keelson could be fitted in. This keelson is ½ inch thick and 6¼ inches wide, and is fastened to each piece of the bottom with ¾-inch screws, staggered alternately in two rows. Considerable fitting was necessary



Detail of seat block assembly



Transom, measurements inside of planking

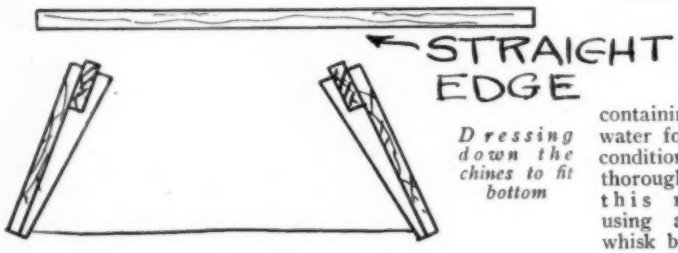
here, especially at the bow. The length is apt to fool one, so the surest way is to cut it too long and cut and try until it fits properly.

The breast hook was now fitted into the bow. It was comparatively simple, but it should be made up of 1¼- or 1½-inch stuff, or it will not properly hold the nails which are driven into it through the sides.

Seats were fitted into the bow and the stern and fastened with screws to short stringers which were, in turn, screw fastened to the frames. These seats were placed about 7 inches from the bottom and were ¼ inch short on each end, so that they would not touch the sides, and so form a collecting place for dirt and moisture.

Again the boat was turned over. The sides which extended over two feet beyond the transom were now carefully cut off, fair with the transom. All joints in the bottoms which showed any roughness were planed smooth.

An outer stem at the bow followed next. It was fastened

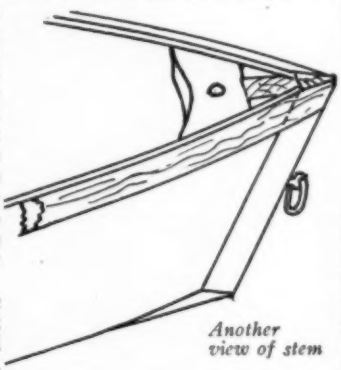


Dressing down the chines to fit bottom

to the inner stem with long screws set into partly bored holes. The ring bolt for the painter or tow line was also set in at this time. I located it half way up the stem, so that when towing, the bow would not be dragged down.

The boat was intended to be used and, knowing from experience that the bottom would get some hard treatment from rubbing over pebbles and stones when on shore, I planned what has proven to be ample protection. First, a flat keel ⅞ by 5 inches, fastened with screws through to the keelson, extends from stem to stern. Secondly, there is a sort of flat bilge keel cut from ½- by 6-inch material and fastened to either side with short screws. These are straight fore and aft on the inside and conform to the sides on the outside. They begin at the stern and extend well forward. These keels do not make her row or tow unusually bad.

Blocks for oar locks were next fitted in place just aft of the seat blocks and screw fastened to the sides.

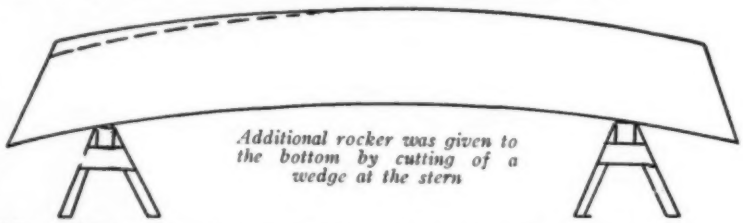


Another view of stem

The work was now finished except for the chafing strips, guards, or gunwales as we might choose to call them. These I made up half round from 2- by ⅞-inch strips. After considerable thought I fastened them on the outside flat with the topsides where they will furnish the most strength to the sides and where they will not hold dirt whenever the boat is washed out. Two coats of home-mixed white lead paint inside and three coats outside and spar varnish applied to the guards, furnished the finishing touches.

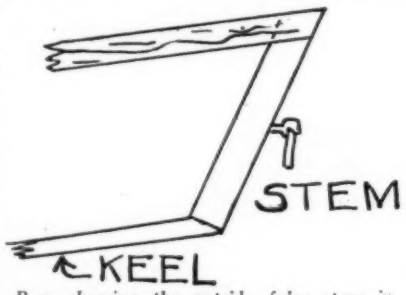
After a Summer's use, I have found her satisfactory in every way. She is a good little sea boat for her size, thanks to the flare given the sides. She carries a load; three with dignity, and four who don't care. Her weight is such that one man can handle her easily on the shore and two can carry her about as easily as a canoe. My only regret is that I did not build her of cedar.

The description of the boat as built thus far covers the requirements for a hull which is to be finished in paint only. An alternative method of completing the hull will be to cover the boat with canvas applied over the wood. As a



Additional rocker was given to the bottom by cutting of a wedge at the stern

preliminary to this method, all sharp corners at the bilges should be carefully rounded off to avoid chafing of the canvas after completion and to reduce the difficulty in stretching the canvas. The corner joint at the transom should also be rounded in the same way. All joints in the bottom which show any roughness or irregular spots should be planed off smooth. The best method of covering a small hull like this with canvas is to apply a liberal coat of prepared marine glue which comes in stock packages ready to apply according to the following method. The can containing the marine glue is placed in a bucket of hot water for a period sufficient to thin the material to a fluid condition. The bottom and sides of the hull are painted thoroughly with this material, using an old whisk broom as a brush. This material will fill all holes and cracks, as well as the seams between the boards. After the glue has set and hardened, the canvas may be stretched over the hull. It should be stretched in a fore and aft direction along the keel first. Then thwartships to the gunwale. Further stretching in all directions will result in a smooth covering over the entire hull. The canvas should then be tacked with galvanized tacks, spaced closely. The next operation calls for the use of the family electric flat iron. This is used to iron the canvas into smooth contact with the cast of glue underneath and just enough to heat should be applied to draw the glue into the canvas material, being careful not to apply heat enough to scorch the canvas or draw the glue entirely through it. Several small glue stains to the square foot of canvas will indicate that the contact between the glue and canvas is sufficient. When both sides have been stretched and ironed into shape, a good coat of shellac should be applied.



Bow showing the outside false stem in position

SMALL MOTOR BOATS

Their Care, Construction, and Equipment

A Monthly Prize Contest Conducted by Motor Boatmen

Questions Submitted for the May Prize Contest

1. How often should the oil in a marine engine crankcase be changed; describe a method for reclaiming the old oil and state to what use it is put.

Suggested by H. H. P., Oakland, Cal.

2. What has been your experience with auxiliary ignition devices for intensifying the secondary current at the spark plugs? Describe and illustrate the outfit used, comparing relative qualities of devices integral with the spark plugs, attached to the plugs, or designed as a separate unit.

Suggested by D. McL., Cleveland, Ohio.

Rules for the Prize Contest

ANSWERS to the above questions for the May issue, addressed to the Editor of MoToR BoatinG, 119 West 40th St., New York, must be (a) in our hands on or before March 25, (b) about 500 words long, (c) written on one side of the paper only, (d) accompanied by the senders' names and addresses.

The name will be withheld and initials used.

QUESTIONS for the next contest must reach us on or before March 25. The Editor reserves the right to make such changes and suggestions in the accepted answers as he may deem necessary.

The prizes are: For each of the best answers to the questions above, any article or articles sold by an advertiser advertising in the current issue of MoToR BoatinG of which the advertised price does not exceed $25, or a credit of $25 on any article which sells for more than that amount. There are two prizes—one for each question—but a contestant need send in an answer to only one if he does not care to answer both.

For answers we print that do not win a prize we pay space rates.

For each of the questions selected for use in the following month's contest, any article or articles sold by an advertiser advertising in this issue of MoToR BoatinG of which the advertised price does not exceed $5, or a credit of $5 on any article which sells for more than that amount.

All details connected with the ordering of the prizes selected by the winners must be handled by us. The winners should be particular to specify from which advertisers they desire to have their prizes ordered.

Heating the Carbureter Intake

Value of Hot Air Supply at the Carbureter With Suggestions For Installing a Practical Device on Existing Motors

Answer to the Following Question Published in January Issue

"Describe and illustrate the best method of conducting heated air from the exhaust line to the carbureter"

Supplying Heat to the Carbureter

(The Prize-Winning Answer)

THE best method to assist the carbureter in vaporizing the poor grades of gasoline obtained now-a-days is with the aid of hot air. This can be best obtained by the use of a sheet metal stove surrounding the exhaust pipe or exhaust manifold and conducted to the air intake of the carbureter by flexible metallic tubing. If the exhaust manifold and exhaust pipe are not water cooled, that is, neither water jacketed or cooled by water injection, the stove may be made any desirable length and fastened in any convenient place on the pipe or manifold. If the exhaust manifold is water jacketed and the pipe water cooled, the stove should be placed between the flange and the water connection on the exhaust pipe, as this will be the hottest spot. A hot air stove is useless over a water cooled section. Figure 1 on the drawing will show the proper location for the stove. The pipe will be very hot between the flange and water connection.

The stove and fittings are best made of galvanized sheet iron. Any boatman familiar with tools can make the stove and fittings or can have it done by a tinsmith. The stove should be roughly four or five times longer than the diameter of the tubing used. The edges of the sheet metal are snipped into a series of points about ⅜ or ½ inch deep, bolt holes drilled, and the hot air tubing hole should be the size of the inside diameter of the tubing. The points are bent down and the metal sheet is bent around the exhaust pipe to get the form, then slipped off and the tubing fitting riveted on. This fitting may be made of sheet metal. The stove is now finished and may be slipped on the pipe and clamped with stove bolts as in Figure 1.

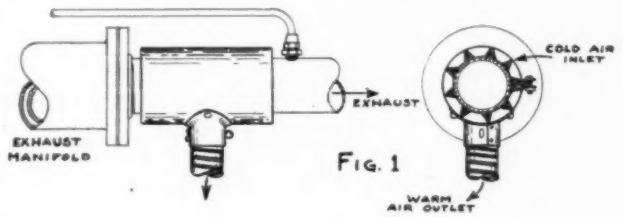


FIG. 1

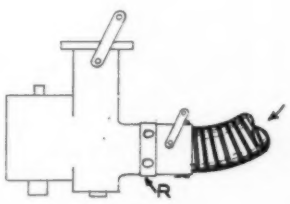


FIG. 3

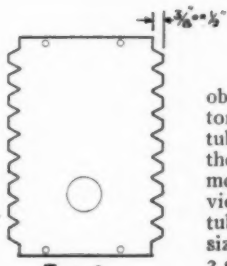


FIG. 2

The best tubing to use is the flexible spiral metal tubing which is made for the purpose, and can be obtained in most any motor supply store. The tubing dimension goes by the outside diameter. Most modern carbureters are provided with a connection for tubing, and tubing of that size should be used. Figure 3 shows the method used on most plain tube carbureters. Holes should be drilled through the fittings and tubing and cotter pins inserted to prevent the tubing from vibrating out of place.

In some types of carbureters there are two air intakes, the primary which is constantly open, and the auxiliary which is opened automatically by the engine suction on a valve. The primary should intake hot air and, if necessary for the auxiliary, may be made

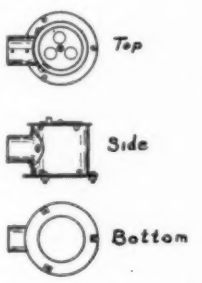


FIG. 5

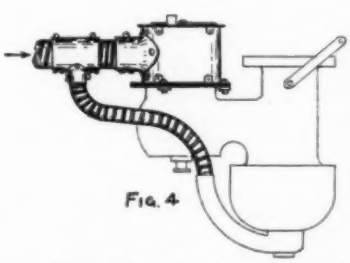


FIG. 4

A well designed carbureter heater which has been used with good results

of sheet metal and fastened under the air valve seat which usually screws into the carbureter body. To facilitate fastening to the carbureter, the bottom ring may be fastened to the rest of the fitting by stove bolts. See Figure 5.

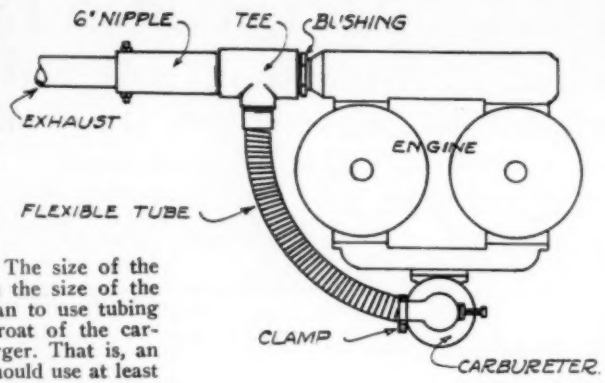
The primary tubing may be connected with the auxiliary by a sheet metal tee as shown in Figure 4. The size of the auxiliary tubing depends on the size of the carbureter. It is a good plan to use tubing of the same size as the throat of the carbureter, or the next size larger. That is, an inch and a half carbureter should use at least an inch and a half tubing.

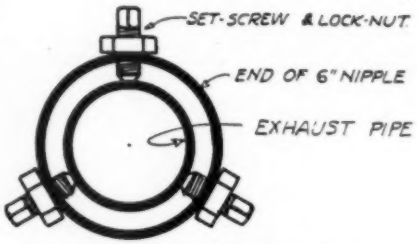
The amount of hot air necessary depends on the type of carbureter, the climate, the grade of fuel, etc. Carbureters of the type shown in Figure 3 usually have a regulating device—R, see Figure 3, which can admit cold air. In the fitting shown in Figure 5, the cold air may be admitted at the top, the amount being controlled by a metal disc containing several holes.

This disc is pivoted in the center with a rivet, and may be turned until corresponding holes drilled in the top of the fitting are in line with those in the disc. A little experimenting will show just how much hot air will be necessary for the best results.

A hot air attachment usually cuts down the horsepower slightly, due chiefly to the friction of air in the tubing and fittings, and the carbureter may have to be re-adjusted slightly to meet the changing conditions. The slight loss of power, however, can easily be overlooked when the smoother operation and greater fuel economy are considered.

A. F. O., Cos Cob, Conn.





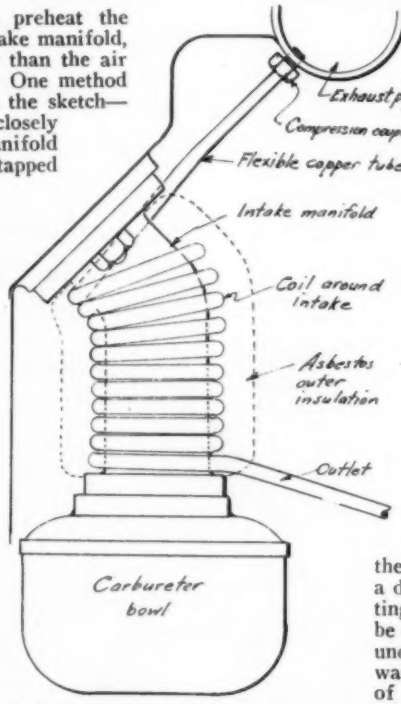
L. R. K. builds a heater for the carbureter from standard pipe fittings and some flexible tubing

Tube Around Intake Manifold

THE more efficient way to preheat the mixture is to heat up the intake manifold, when this is possible, rather than the air before this enters the carbureter. One method of accomplishing this is shown in the sketch—a copper flexible tube wrapped as closely as possible around the intake manifold and bound with wire; one end is tapped directly into the exhaust pipe by means of a compression coupling, and the other end led outboard by the shortest route. This allows the live exhaust gases to pass around the intake pipe and warm it, and to increase the efficiency of the device, sheet or rope asbestos should be wrapped around the outside of the coil after the latter is fastened in place.

Five-sixteenths, or possibly three-eighths, copper tubing is about the largest that can be handled and, as this cannot be bent cold to a small radius, melted rosin will first have to be poured into the heated tube; when full and cooled off, it may be bent around the manifold and the rosin later melted out. If the manifold can stand a higher temperature, lead can be used instead of rosin. Sometimes flexible metallic conduit can be obtained in small diameters, and such can be used to good advantage instead of the copper tube, provided it will stand the heat of the exhaust gas.

H. H. P., Oakland, Calif.



H. H. P. wraps a flexible copper coil around the intake pipe and heats it with exhaust gas

Heating Air For the Mixture

A SIMPLE outfit for conducting heated air from the exhaust line to the carbureter was made for a two-cylinder engine of eight horsepower, having a 1½-inch exhaust pipe and 1-inch carbureter, as described below. Being made of pipe fittings and standard flexible tube with a few tapped holes, it is quite easily made.

The outfit consists of a 2½-inch nipple 6 inches long; a 2½ by 2½ by 1¼-inch tee; a 1¼-inch nipple 2 inches long; and a 2½ by 1½-inch bushing with the 1½-inch thread filed out to admit the 1½-inch exhaust pipe tightly. The 2½-inch nipple has 3 holes tapped around the open end, for ¼-inch set screws with lock nuts. The outfit is assembled and slipped over the exhaust pipe up close to the engine manifold and the set screws are adjusted to form a uniform annular ring around the exhaust pipe, for the air passage. Then clamp the heater in place.

This part of the outfit is covered with several layers of asbestos, as the exhaust pipe is not cooled with water at this point, the cooling water being admitted to the exhaust line immediately after passing the heater.

A short piece of 1¼-inch flexible tube is attached to the 1¼-inch nipple and in an easy curve extends to the carbureter intake, to which it is clamped.

Of course the sizes given here apply to this engine but it can be adapted to other sizes, keeping in mind that the heater should have a free area for the air of about twice the area of the carbureter intake, to keep down the resistance and the sucking noise, which would occur if it were constricted. The pipe from the heater to the carbureter should be as short as possible and have no sharp bends.

A similar outfit is being made now for a smaller engine and to keep it as light as possible, thin brass pipe is being used instead of standard weight pipe.

It will be found that pre-heating the air supply to the carbureter will improve the operation of the motor, with the possible exception of the very hot days in mid-summer. At such times it would be advisable to operate the motor with the air intake wide open without using the heated air. An additional advantage with a device of this kind is the possibility of admitting water vapor into the mixture. This may be done by inserting a small flexible copper tube under the stove and adjusting the drip of fresh water by means of a needle valve. The addition of this water vapor will improve the running of the motor and reduce the carbon deposits to an appreciable extent.

L. R. K., Philadelphia, Pa.

The Outboard Motor as an Auxiliary

Clever Suggestions For the Fitting of the Portable Motor to the Cruiser For Emergency Service

Answer to the Following Question Published in the January Issue

"Describe the best method of attaching an outboard motor to a cruiser or other boat, so as to act as an auxiliary in case of trouble

The Emergency Outboard Motor

(The Prize-Winning Answer)

TO attach an outboard motor to a motor boat to use as a means of propulsion in the event of engine breakdown is but a make-shift, which is perhaps better than nothing. I have had occasion to push a thirty-five-foot launch, in a calm, with a rowboat, made fast to the quarter, equipped with a two-horsepower outboard motor. The speed was about two miles an hour.

However, the arrangement shown on the accompanying sketch may be more efficient than using a row boat as described above, provided the water is not too rough. If the water is rough an outboard motor will hardly develop sufficient power to push a boat to windward, but will do to go to leeward.

The method of attaching motor is to have a removable oak plank about 1¾ x 10 inches bolted to the transom as shown. The transom is fitted with two oak cleats on the inside to take the strain of the attaching bolts. A cover-piece is provided over each cleat, in which are imbedded the nuts and washers of the bolts. The holes for the end of the bolts in the cover-piece should not go through the piece, but should be deep enough to allow a bit of play for tightening up the bolts. These are securely fastened with screws to the transom with a cotton flannel gasket in each joint. This will keep the transom water-tight if the holes are open.

When the boat is painted, the nuts should be greased to prevent the threads rusting. The bolt holes may be plugged with corks, cut off flush and painted over. The corks can be easily removed when required.

Be sure to make a substantial job of it, as the vibration from an outboard motor is considerable.

It is a good plan to have a line about a half inch thick attached to the motor and the other end made fast to the boat to prevent loss of the motor should it get loose from any cause.

A. G. W.,
College Point, N. Y.

An Outboard Motor Bracket

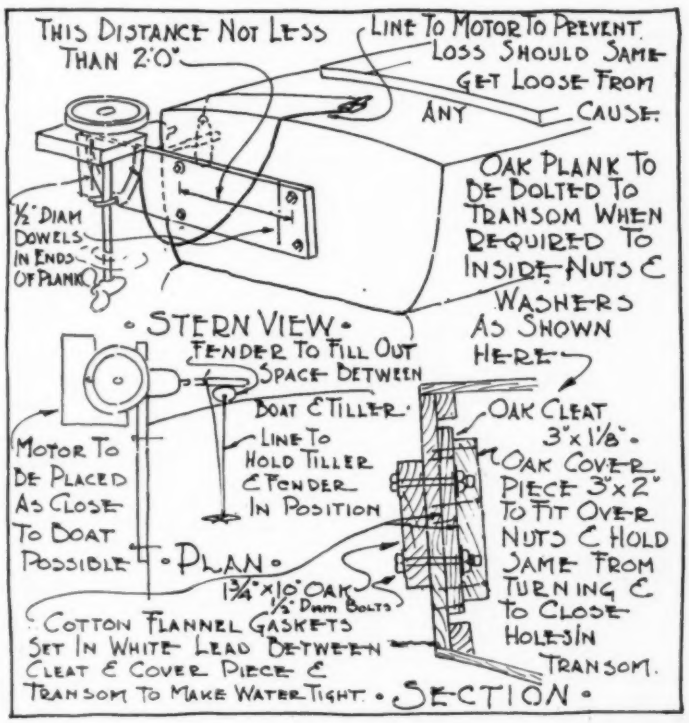
IN using the outboard motor as an auxiliary, there is really only one place to put it and that is off the stern. Placing the motor any place on the side is impractical, for the simple reason that the boat is bound to roll and keep dipping the motor up and down, and perhaps give it a complete bath.

This description covers a rig made to hang off the stern that may be removed easily and stored away in a comparatively small place. The rigging is fastened on deck much the same as the boarding steps, by swinging the lower part of the outfit upwards in a circle and unhooking it. The only thing that remains fastened to the deck are two cleats marked C on the drawing.

The bracket is made of ½-inch by 1½-inch strap iron, bent in a similar fashion to that shown on the sketch and to dimensions taken from the boat. The distance marked X should be such as to insure a good fit from the deck to the underside of the transom so as to hold the outfit snugly. Two pieces marked A and B are bent to the shapes shown, and are drilled and riveted at the intersections with flat head rivets at points where the iron strap lies against the transom. That portion of the frame which rests against the transom should be covered with rubber hose or canvas to protect the stern.

The oak or ash board for holding the motor should be made as heavy as the clamps on the motor will allow. This board is bolted to the two frames of iron. Bolts are used here so that the whole thing may be taken apart and stored in a flat compact space. As an addition, but not a necessity, two struts marked D may be used to give rigidity to the rigging. These can be made of ¾-inch iron, flattened at the ends. These are bolted through the oak board on one side and fastened to the opposite frame with a stud riveted into piece B. This outfit can also be used as a temporary rudder, should the ship's rudder be carried away or go out of commission. In using the outfit, the motor should be lashed in a fore and aft position.

J. C. H., New York, N. Y.



A very simple method of attaching the outboard motor to the transom suggested by A. G. W.

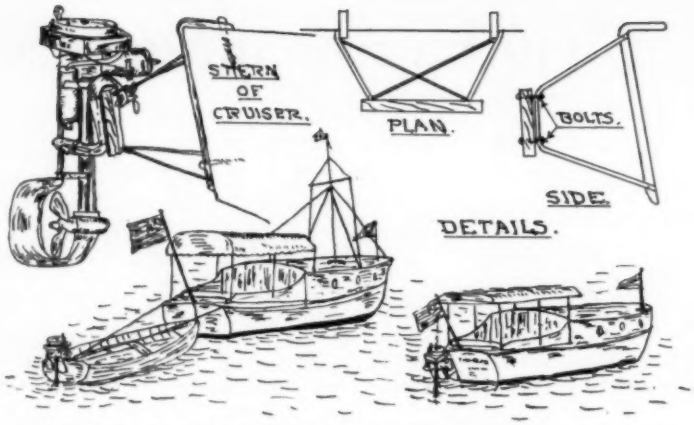
Pushing the Cruiser

THE modern marine motor is as reliable a source of power as any internal combustion motor manufactured. When you compare the medium and heavy duty motors with the better class of automobile motor, both designed for a given service, it is hard to understand, how, under intelligent care and operation, the failure of the motive power to such an extent as to necessitate the employment of auxiliary power can occur. Motor boat owners are rapidly becoming proficient gasoline engineers, but there are still some careless and indifferent ones, and quite a few old motors on the water.

The failure of the motor used to mean hard work with the oars, a scull, or a tow. The outboard motor

now provides an auxiliary source of power, capable of bringing the boat home faster than a man can row it and without tiring anyone. The primary object of an outboard motor aboard any cruiser is to drive the tender which is seldom left home, and on the tender is the most practical place to use the dwarf for a giant's work. Don't try to tow the cruiser for any distance. Progress will be slower and the party divided. Make the bow of the tender fast close up under the stern of the cruiser, and stay it in a fore and aft position to the cruiser by lines from its stern to each side of cruiser's stern. Start the kicker and let her push. In this way the flow of water to the propeller is practically unobstructed and the power is applied to the best advantage.

It is generally conceded that it is easier to pull than it is to push, but this does not seem to apply here. There is a reason besides accessibility for putting the power yawl close up under the stern of the old schooners and pushing them. The same power driving a propeller on the schooner itself would hardly move her. Practically all the canal tows are pushed ahead of the power barge for the length of the Hudson River. The reason is obviously easy going.

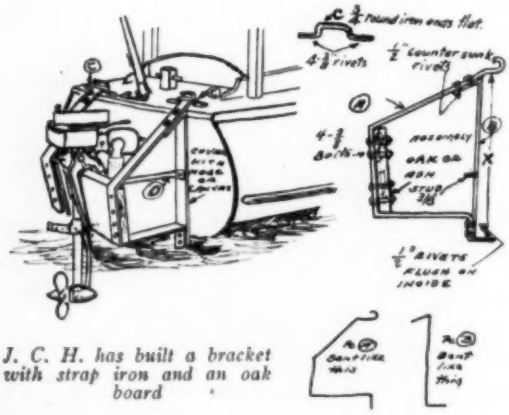


W. B. M. builds a detachable bracket over the transom, and also suggests using the dinghy as a pusher

Attaching an outboard motor at the center of the transom of a cruiser and getting satisfactory results is impractical. The small propeller would be working at a disadvantage several times greater than a propeller working behind a heavy deadwood. You know the effects of a man size propeller, and when this little fellow that you can carry around with you, tackles a man size job, give him all the chance possible. Place the detachable motor well to one side of the stern, where the flow to the propeller will be less obstructed.

In most cases when the outboard motor is attached directly to the cruiser's stern, the propeller would not be sufficiently submerged to operate properly. To get the propeller sufficiently below the water, it may be necessary to construct a special bracket of oak and iron, similar to the one shown, so as to clear the flywheel and motor cylinder. The steering lever will probably have to be removed. All propellers would be more efficient if at right angles to the water's surface. So adjust the bracket until the wheel is in this position.

The bracket shown is for a straight transom cruiser, but may be altered according to the boat. In fact, the bracket design must be according to the cruiser stern and the type of outboard motor used. The bracket is composed of two pieces of light angle or channel iron, bent to conform to the transom and the deck angle, an oak board for attaching the motor to, and the connecting rods and braces. The angles or channels are drilled and slotted for heavy round head screws on deck and in the transom just above the water line. Rods are in one piece from angles across the board and back to the angle. Braces are welded, riveted or bolted to the rods which are fastened to the angles in like manner.



J. C. H. has built a bracket with strap iron and an oak board

Where no provision has been made for using the detachable tender motor as an auxiliary in case of a break down, the ingenuity of the operator in assembling material at hand into a bracket that will answer in case the tender is not available, will make its use possible. Wood and nails will hold an emergency rig together, and a man can sit on it to hold it down. The thrust of the propeller will hold the bracket against the stern and it can be stayed with ropes.

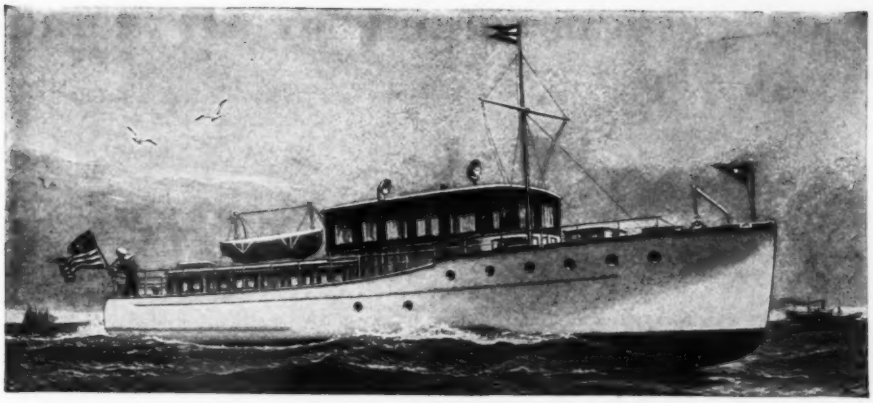
In case of failure of the main motor, try the tender motors on the small boat if possible, but if not, don't give up until you have tried and failed to rig the detachable on the stern, and in any event, put a line on the kicker for safety.

W. B. M., Newburgh, N. Y.

Use the Outboard Motor As Intended

THE reliability of the modern power plant is such that it seems highly improbable for an engine to so cripple itself in ordinary service and under constant supervision that the possibility of the outboard motor being called upon for emergency service seems very remote. It is hardly to be considered necessary to lay plans in advance for this contingency. Any power plant which would necessitate the carrying of an outboard motor for emergency use is hardly deserving of the name and had better be discarded promptly. The outboard motor is a most excellent little machine for driving a tender and performing the work which it was designed to do. In order to apply this small power plant to the work of moving a large hull, even in an emergency, it hardly seems advisable to construct any elaborate gear for the purpose. At best, the little motor when attached directly to the hull could hardly hope to move it against any current, or even a moderate breeze. The natural way would be to secure the motor properly to the tender as designed, and then use the tender as a means of pushing the larger boat. It has proven the case in practice that these little boats are not very successful as tow-boats. A peculiar fact is that they will push a boat very much more effectively than they will tow. The simplest method would be to lash the small boat alongside the larger one on either the port or starboard quarter attaching it securely so that it will remain firmly in position. In this way the larger boat can be directed with its own rudder and the little motor can be kept under observation. An alternative method which has some advantages would be to secure the little boat astern so that its stem is securely tied to the transom of the larger boat. It is necessary here to place a suitable fender or cushion between the two boats to take care of any impact that might occur. It can be secured in such a way that longer lines leading to the stern of the small boat may be used to pull it one way or another for the purpose of steering the larger boat. The only accident which would necessitate the use of the outboard motor both for propulsion and guidance would be one which injured both propeller and rudder.

A. J. C., Waterbury, Conn.



A new type Elco Standardized cruiser, 54 feet long with twin screws driven by J. V. B. motors

Standardization as Opposed to Experimentation

By Thomas S. Hanson

A PROMINENT textile manufacturer inquired of me recently, if I had any idea of the difficulties which surround a man when he desires to buy a satisfactory motor boat. And how completely true this is.

Take the merchant, the banker, or the professional man, whose habits and training have not led him along mechanical lines; who, attracted by the joys and health-giving pleasures to be derived from week-ends and holidays spent upon the water, concludes he would like to own a motor boat. Knowing nothing of the trade, or its manufacturers and, perhaps never having heard of a yachting magazine, he just naturally seeks the advice of some friend. Thus begins for him experiences fraught with a confusion of ideas and a bewilderment of advice.

His pursuit usually leads him to some boat yard where he imagines he should see different models, enabling him to formulate his ideas as to the boat best suited to his purpose and from which he can make a selection. But what does he find at the boat yard? Depending upon its size, one to a half dozen boat hulls in various stages of incompleteness; none of them far enough advanced to convey to him any conclusive ideas of what they will look like when they are finished. And usually they are all Special Models, the details of which are being worked out as their construction proceeds.

Then he is shown blue prints—quantities of blue prints—all kinds of boats and arrangement plans, which have seldom progressed beyond the stage of the draftsman's board. And, from this most unsatisfactory array of incompleteness, he is expected to make his selection.

What other article, of any sort whatsoever, would a man buy developed and constructed in such a manner? Has anybody's first model of a motor car ever been so successful that anybody would wish to purchase it? Hardly. Success, in the hands of the user, only came after the motor car had been built and tried out by the manufacturer and then re-built again and again. The best mechanical skill and brains in all England were concentrated upon the design and construction of the famous British Tanks. Yet, the first experience with them on the field of battle, developed such weaknesses that they had to be designed practically all over again. It took the war and millions of dollars to perfect the aeroplane, and yet, even today, it is still in the experimental stage.

There is a story of a professor of architecture in a technical college, who undertook to design for himself his idea of the ideal house. He refused all advice and insisted that the contractor build the house exactly as designed. When the house was finished it was found to have no chimney.

From the moment the keel is laid until the boat is completed, every detail is a matter of compromise, and it, therefore, just naturally follows that the only way to correctly establish all of the innumerable compromises, is by building and re-building the model many times. One seldom can have all their desires fulfilled in any one boat. Comfort, seaworthiness and reliability must be sacrificed for high speed, and it is never advisable to try to crowd too much into a given size of boat, as to do so usually results in a complete sacrifice of every desirable feature.

Whenever I am asked, as I frequently am, for a seagoing cruiser, forty-five feet long, to have a saloon, two staterooms, a bath and a speed of twenty-five miles, I am reminded of the man who rushed into a Dutch barber's, exclaiming, "Hurry, give me a shave, a hair-cut, and a shampoo; I have only fifteen minutes to catch a train." The Dutchman looked at him and said: "You want the shave first, yes?" and proceeded leisurely. When he had finished with the shave, he turned the customer out, with the remark —"Der now, mein friend, go catch your train, and don't never again ask such things, because some day some fool will try to give them to you."

The only way The Elco Works was successful in building all those seven hundred Submarine Chasers was to take plenty of time perfecting the first one and making all the necessary changes and corrections in trying out the first ten. Even after building the first fifty, it was found necessary to lengthen the future boats by five feet.

When we advocate standardization, this is what we mean. Perfecting the details, first in the design, then in the construction, then in the power plant, and finally in every last fitting and item of equipment. The only way you ever attain perfection in anything is by doing the thing over and over again and profiting by your mistakes in a most intelligent manner.

I am convinced that this is the way to produce motor boats that will prove to be entirely successful in the hands of the customer, and it is by a strict adherence to these methods that The Elco Works has been enabled to deliver a Cruisette to a purchaser within three hours after he had ordered it, secure in the knowledge that the boat would prove completely successful in the purchaser's hands and fulfill every promise made for it.

When the boating public becomes convinced that by these methods only can reliable boats be produced at reasonable prices, then will the delights of motor boating spread among the millions of this country's vast population, who now know nothing of the charm of summer days spent upon the water.

Some Questions on Small Boat Handling

Lesson No. 13, MoToR BoatinG's Correspondence Course

(Answers should be sent to the editor of MoToR BoatinG, 119 West 40th St., New York, N. Y.)

1. Which is the weather side of the boat?
2. Which is the leeward side of the boat?
3. What is meant by off the wind?
4. What is meant by down the wind?
5. What is meant by windward?
6. What is a beam wind?
7. If the helm is put to port which way does the bow swing?
8. If the helm is put to starboard which way does the bow swing?
9. As a general rule, which way does the bow tend to swing due to the action of the propeller?
10. In making a landing, as a general rule, is it preferable to run the port or starboard side of the boat alongside of the float when winds, currents, etc., are not a factor?
11. When going full speed ahead, how many strokes on the engine-room gong indicate full speed astern?
12. In turning around in narrow quarters, or in restricted quarters, is it better to turn to port or to starboard?
13. In backing, does the bow tend to swing toward the port or starboard?
14. When it is necessary to back in restricted quarters, is it better to plan to back so that the bow will swing to port or to starboard?
15. A raised deck cruiser is made fast to a float and is heading due north, the wind is blowing from the north, turning quarters are limited, but the course which the boat is to take is due south; describe the best method to get away from the float and get on one's course.
16. A raised deck cruiser is made fast to a float and is heading due north, the wind is blowing from the northeast, turning quarters are limited, but the course which the boat is to take is due south; describe the best method to get away from the float and get on one's course.
17. A raised deck cruiser is made fast to a float and is heading due north, the wind is blowing from the east, turning quarters are limited, but the course which the boat is to take is due south; describe the best method to get away from the float and get on one's course.
18. A raised deck cruiser is made fast to a float and is heading due north, the wind is blowing from the southeast, turning quarters are limited, but the course which the boat is to take is due south; describe the best method to get away from the float and get on one's course.
19. A raised deck cruiser is made fast to a float and is heading due north, the wind is blowing from the south, turning quarters are limited, but the course which the boat is to take is due south; describe the best method to get away from the float and get on one's course.
20. A raised deck cruiser is made fast to a float and is heading due north, the wind is blowing from the southwest, turning quarters are limited, but the course which the boat is to take is due south; describe the best method to get away from the float and get on one's course.
21. A raised deck cruiser is made fast to a float and is heading due north, the wind is blowing from the west, turning quarters are limited, but the course which the boat is to take is due south; describe the best method to get away from the float and get on one's course.
22. A raised deck cruiser is made fast to a float and is heading due north, the wind is blowing from the northwest, turning quarters are limited, but the course which the boat is to take is due south; describe the best method to get away from the float and get on one's course.
23. It is desired to land at a float, having three sides free to land against. The offshore side of the float bears north-south and the other two sides bear east-west. Assuming that there is plenty of room to maneuver, describe how you would land at this float, on which side of the float and with which side of the boat when coming from the south with the wind blowing north. (No current.)
24. In question 23, describe landing with the wind northeast.
25. In question 23, describe landing with the wind east.
26. In question 23, describe landing with the wind southeast.
27. In question 23, describe landing with the wind south.
28. In question 23, describe landing with the wind southwest.
29. In question 23, describe landing with the wind west.
30. In question 23, describe landing with the wind northwest.
31. In question 23, assuming that there is no wind, but that the current is flowing from the north, describe how you would land when coming up from the south.
32. In question 23, assuming that there is no wind, but that the current is flowing from the south, describe how you would land when coming up from the south.
33. Assuming you desire to pick up a mooring on the Hudson River with the tide flowing ebb and your boat coming down the river, describe how you would do it.

(*Continued on page 98*)

LESSON NO. 13, published in February MoToR BoatinG, was the last lesson in the Correspondence Course in Small Boat Handling, Seamanship and Piloting which has been running in MoToR BoatinG for the past year. The questions on Lesson No. 13 are printed in this issue and their answers should be sent to us at any time convenient. Those answers received by us during March will be submitted to the examiners on March 31 and the names of those who successfully pass will be printed in the May issue of MoToR BoatinG.

As soon as possible after the reports have been received from the examiners, the Pilot's Certificates will be issued and forwarded to those who have passed all the lessons by the required 80%. Those who have failed in one or more lessons and who desire to submit another set of answers on those lessons have the privilege of doing so.

In the April issue of MoToR BoatinG we will begin to review the Correspondence Course, Lesson by Lesson. That is, in the April number we will take up Lesson No. 1 which was on The Rules of the Road, Hints on Motor Boat Handling and Proper Whistle Signals to Blow. We will print the correct answers to the questions of Lesson No. 1 as well as discuss the various points which were most generally misunderstood as judged by the answers we received. In this way we hope to review the course in a way which will be of the greatest benefit to our readers.

That the course is now completed does not mean that those who have not yet sent in their answers to the complete set of lessons will be barred from submitting further answers. Neither does it mean that those who have failed in one or more lessons may not try again. Even those who have not yet enrolled may still do so if they care to.

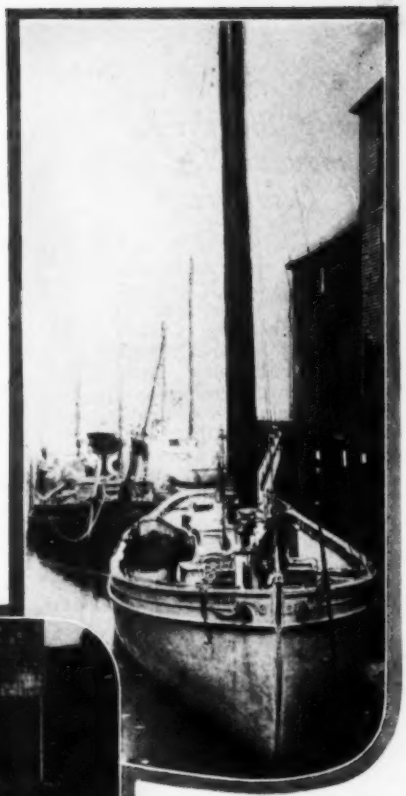
However, as we are to publish the correct answers beginning with our April number, naturally, we can not accept answers received subsequent to their publication. Therefore, all answers to Lesson No. 1 must be in prior to April 1, 1922; those to Lesson No. 2 on or before May 1; Lesson No. 3, June 1, etc., etc.

The course which has just closed has been so successful that it has led us to decide on another Correspondence Course which begins elsewhere in this issue. We hope all of our readers who have followed the first course so closely will be with us again in the Correspondence Course in Dead Reckoning.

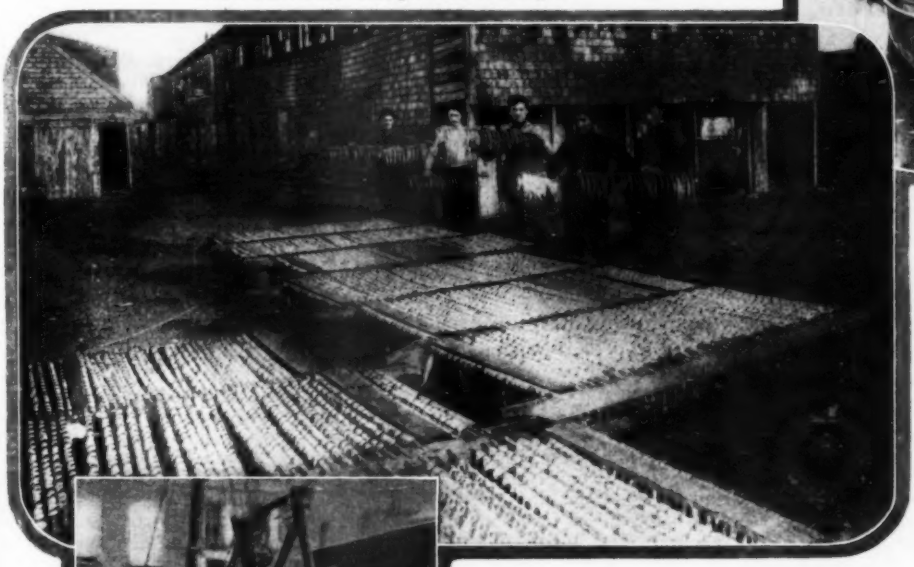
Motors in the Fishing Industry

Commercial Fishing Carried on Extensively, Motors Make Possible Increased Production Per Boat

Along the water front at Eastport, Maine. The sardine fishing craft which make their headquarters at Eastport



The home of the American sardines, Eastport, Maine, where the first canneries were established in 1875. Cora H., owned by Captain John Henderson, carries 35 hhg. of herrings, and is equipped with a 24 h.p. Globe gasoline engine



How the herrings are smoked. Sticks of newly strung herrings and sticks of fish drying on the low wooden horses on the wharf. The fish are left in the sun to dry before being removed to inside smoke houses to be cured over slow-burning wood fires

Installing a heavy crude oil engine in a sardine fishing boat at the Seacoast Canning Company, Eastport. They own a large fleet of many types

Motor boat racing is also popular on Passamaquoddy Bay. These five boats fitted with 7½ h.p. Mianus gasoline engines frequently compete in races

Yard and Shop

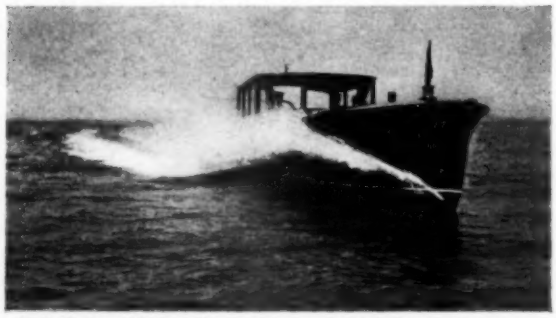
Notes of Interest to Both Owner and Manufacturer

Cox & Stevens Remove to New Quarters

The firm of Cox & Stevens, well known naval architects, yacht and vessel brokers, will remove to more spacious offices in the new Cunard Building, 25 Broadway, New York, about March 1st. Their new offices will accommodate the designing force in addition to the executive staff. Due to shortage of office space, the designs division has been located in Brooklyn, which has made communication somewhat inconvenient.

Cox & Stevens report a considerable improvement in the outlook for yachting during the coming season, having several large pleasure craft under construction from their designs, with immediate prospects for additional contracts for new yachts, in addition to several important commissions for the designs of commercial vessels which are now being built.

The brokerage department reports a noticeable increase in the volume of pleasure craft of various kinds now changing hands.



Bobolink, a 42-foot limousine runabout built by Hutchinson Bros., Alexandria Bay, equipped with a six-cylinder model G R dual valve Sterling motor of 225 h.p.

One of the popular styles of St. Lawrence River skiffs built in 16 and 18-foot sizes by the Crescent Motor Boat Co., Clayton, N. Y. These boats, known as the O model, are designed to be driven by both inboard and outboard motors

Kermath Motor Gives Good Service

A well satisfied user of a Kermath marine motor writes to the manufacturers and comments favorably on the excellent service obtained from a small 10 to 12 h.p. engine manufactured away back in 1912. He says further that "The machine and ignition outfit which you attached have given me absolutely no trouble. I have been running since Memorial Day, and am still in commission. My fellow club members and others can't understand how my little engine can push my 28-foot raised deck cruiser Elk.

I seem to cover ground as fast and faster than smaller outfits with more power, and I sure can josh them about fuel consumption. I am turning the 18-inch diameter by 16-inch pitch Hyde wheel as you recommended. I might add that the spark plugs have not been removed from the motor for a full year.

The same dependable long life service can be expected from all motors which are built with the same rugged foundation.

Evinrude Advance Catalog Is Ready

A booklet giving up-to-date information and snappy in style is ready for those who are interested in Evinrude motors. In addition to descriptions and new prices of the 1922 models, both the standard and the lightweight outboard motors are completely illustrated. A separate folder fully describes the new two-cylinder inboard motor of 4-5 h.p. A complete new catalog is also in preparation, and a post card request addressed to the Evinrude Motor Co., 619 Evinrude Building, Milwaukee, Wis., will bring this literature to you.

A New Piston Material

Material manufactured by the Dow Chemical Co., Midland, Mich., and christened Dowmetal, is being used for the manufacture of lightweight pistons for use in internal combustion engines. This alloy is composed of a high percentage of magnesium, to which have been added small amounts of other metals to give it the particular properties necessary for use in pistons. This metal is the lightest of all metals, having properties valuable for engineering purposes. Aluminum, which is considered to be light in weight, is fifty per cent. heavier. Its tensile strength is high, the alloy being stronger than either cast iron or common aluminum alloys. Important details in piston design were thoroughly investigated under actual service conditions, and a standardized design for pistons made of Dowmetal has been adopted. On account of the light weight of this material it was not necessary to reduce the thickness of the piston sections. Heat conductivity is very high, being two or three times that of cast iron, and comparable with that of aluminum. These pistons are termed non-scoring, even under extreme conditions, when the motor is run to the seizing point through lack of lubrication, these pistons will not score the cylinders.

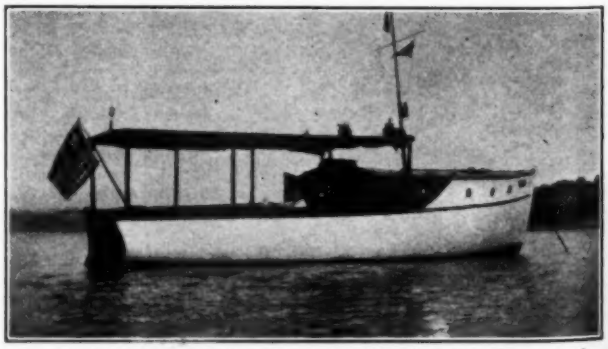
New Hall-Scott Booklet

A new folder has just been prepared by the Hall-Scott Motor Car Company and is ready for distribution to prospective engine buyers. Many new and interesting boats which have been equipped with Hall-Scott marine motors are illustrated and described, and specification of these popular motors are included. Copies of this booklet will be supplied to interested readers by addressing the Hall-Scott Motor Car Co., Inc., at 887 Niagara Street, Buffalo, N. Y.

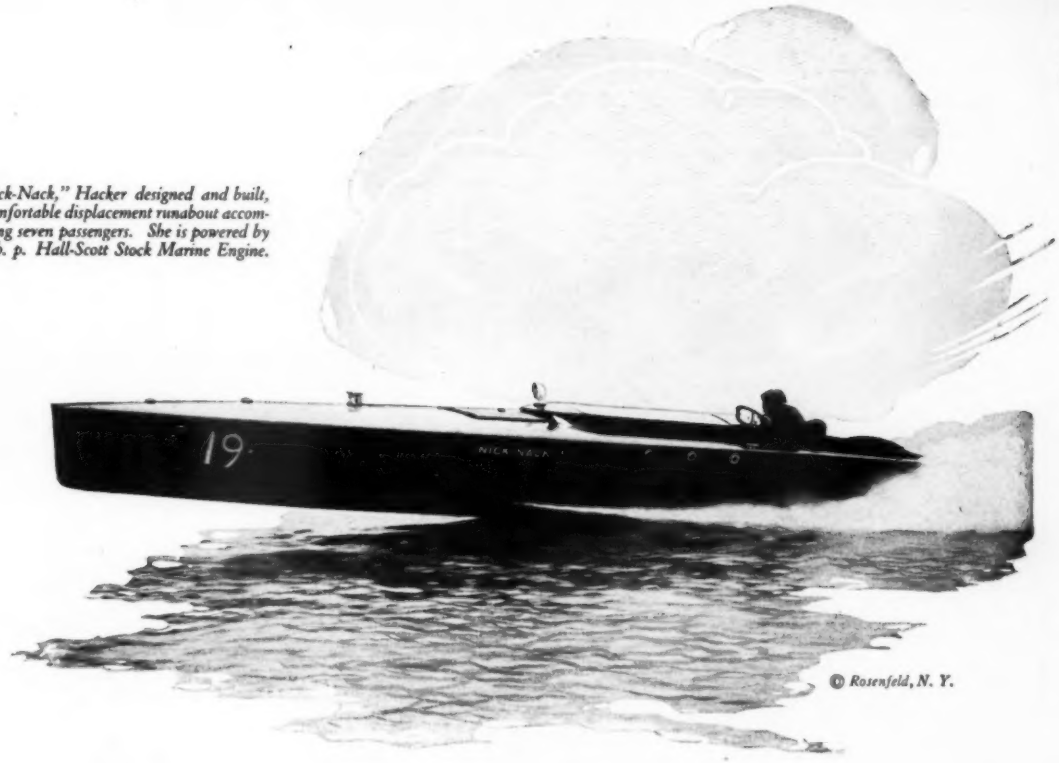
Topping Brothers Established in New Quarters

A new reinforced concrete office and warehouse building was completed not long ago for Topping Brothers to take care of their increasing volume of business. Located at Varick and Van Dam Streets in lower New York. This new building will supply an available floor space of 70,000 square feet. The offices, receiving and shipping departments will be located on the first floor, and the remainder of the building will serve as warehouse. The nature of the marine hardware stocks carried is exceedingly heavy in weight and, in designing the building, Russell G. Cory,

(*Continued on page 62*)



The 28-foot raised deck cruiser Elk which is driven by an early model Kermath motor which has given her owner excellent service for many years



"Nick-Nack," Hacker designed and built, is a comfortable displacement runabout accommodating seven passengers. She is powered by a 200 h. p. Hall-Scott Stock Marine Engine.

© *Rosenfeld, N. Y.*

Another Record-Breaker — and Valsparred, of Course!

LAST summer's regatta at the Detroit Yacht Club saw many exceptional performances. But perhaps the most noteworthy was the creation of three new *World's Records* by "Nick-Nack," the property of Vice-Commodore Humphrey Birge of the Buffalo Launch Club.

In the Wood-Fisher Trophy events on August 27th, 29th, and 30th, "Nick-Nack" won for herself the title of "fastest marine engined displacement runabout in the world." This latest speed demon smashed all former World's Records for boats of her class in: first, a 2½-mile lap; second, a 50-mile heat; third, a 150-mile race.

"Nick-Nack" is a product of the Hacker Boat Company, Detroit, Mich. In a recent letter to us John L. Hacker, President of the company, says: "'Nick-Nack' was Valsparred throughout, as are all boats built by the Hacker Boat Company."

And "Nick-Nack" is only one of the many record-breaking speed-boats varnished with Valspar — for yachtsmen have always recognized the advantages of a varnish which is proof against water and weather, oils and gasoline. They know that Valspar is the varnish that won't turn white under any exposure or hard usage.

VALENTINE & COMPANY

Largest Manufacturers of High-Grade Varnishes in the World
Established 1832

New York Chicago Boston Toronto London Paris Amsterdam
W. P. FULLER & CO., Pacific Coast

This Coupon is worth 20 to 80 cents

VALENTINE'S VALSPAR
The Varnish That Won't Turn White

VALENTINE & COMPANY, 456 Fourth Ave., New York

Valspar . . . ☐
Valspar Bronze Bottom Paint . ☐
Valspar Stain . ☐
State Color .....
Valspar Enamel ☐
State Color .....

I enclose dealer's name and stamps, amounting to 15c for each 35c sample can checked at left. (Only one sample of each product supplied at this price. Write plainly.)

Dealer's Name .....
Dealer's Address .....
Your Name .....
Address .....

M.B.3-22

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THE MOTOR BOATING MARKET PLACE

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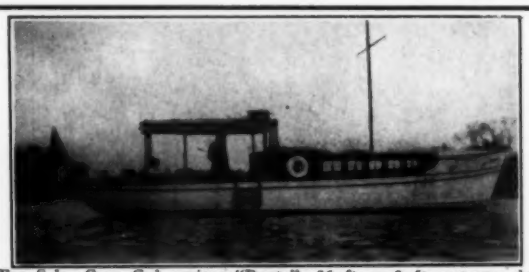
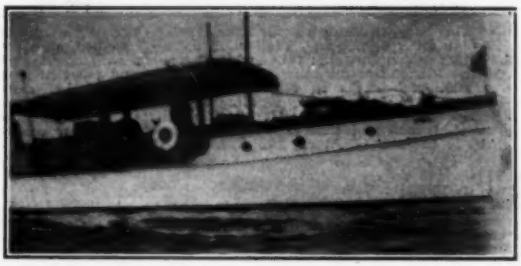


For Sale—Cape Cod cruiser "Bunty", 36 ft. x 3 ft. extreme draft. Standing top, full headroom, side curtains, glass enclosed front. Four cycle, three cylinder Lathrop engine, Paragon clutch, Bosch magneto, generator and switchboard, electric lighted cabin and cockpit. In excellent condition, ready for commission. Insured $4000. Will consider reasonable cash offer. Winter berth, Stuyvesant Yacht Club, Pelham Bay; inspection by appointment. L. Heckt, 105 East 16th St., New York City. Stuyvesant 1708.

For Sale—New 24 ft. x 7½ ft. x 2 ft. Navy motor sailing Launch. Very heavily built. Price $400. W. L. Warner, 344 Washington St., Middletown, Conn.

For Sale—Bridge deck shoal draft cruiser; 40 x 11 x 2.6; 93 H.P. Van Blerck motor; electric lights; fore and aft staterooms; 2 toilets; galley, etc. Will put in commission ready to sail by June 1. Frank G. Wild, 164 Montague St., Brooklyn, New York.



For Sale—The Firefly, bridge deck cruiser, built in 1917 by Woods & Chute, of Greenpoort, L. I., 36 x 9, 6 x 3, 8, engine 4 cylinder, heavy duty, 46 H.P., Bosch equipped, speed 9 to 10 miles, sleeps five in three separate compartments, two toilets, two clothes presses, 6 foot 6 headroom throughout, electric lighting, boat is handsomely finished in every detail, is in absolutely perfect condition, battery and deck awning new in 1921, dinghy, searchlight, etc.; has cost as equipped $11,000, price $6,000. A. J. Patterson, 58 West 47th St., N. Y. C. Bryant 1681.

FREE Illustrated Literatures. Outboards, New and Rebuilt Engines. Universal Joints, Pumps, Clutches, Gears, Hyde's, Gordon Reversible Propellers, etc. Canadian Boat & Engine Exchange, Toronto.

For Sale—Sloop Miracle, 26 ft. x 7 ft. O. A. Keel type, oak frames, cypress planking, assembled with brass screws. Full equipment. First class condition. Photographs and details on request. Price $500. C. A. Spear, 101 Electric Ave., Rochester, N. Y.

For Sale—Scripps D-6 motor. 6 cylinder 60-75 H.P. Used ten days running generator during coal shortage. Price $1300.00 F.O.B. Detroit. Ockford Printing Co., 608 Howard St., Detroit, Mich.

Wanted—40 to 60 H. P. 4 cycle 4 cylinder Marine Engine with electric starter. Must be guaranteed perfect condition. Send full description and manufacturer's cuts Box 75, Green Bay, Wis.

Automobile for Exchange—Cost five thousand dollars, like new; will give it for high class runabout in good condition; or would exchange automobile and thirty-foot Hand V bottom raised deck cruiser for larger cruiser. Address Oliver F. Strayer, Harrisburg, Penna.

Engines—New and rebuilt, four to forty horsepower, for sale at reasonable prices. Brown-Talbot Machinery Co., Salem, Mass.

For Sale—Detachable rowboat motor, battery ignition, 2½ H. P. Good running order. $35. G. W. Tomlinson, 514 Potter St., Saginaw, Mich.

One six cylinder motor, bore 4½ in., stroke 6 in., developing under continuous load 50 H.P. at 1500 R.P.M. normal operating speed. This motor was operated in a 28 ft. runabout where 24 miles an hour was easily shown. This motor was replaced with a much larger motor for greater speed. The motor was operated but a few hours and is in perfect condition, fully equipped with Westinghouse starting motor, generator and double ignition, one set of plugs by battery system, other set of plugs by Bosch magneto. Carburetor, oil pressure gauge and all necessary couplings to connect with Joes gear included with this motor, also used but a few hours. Entire equipment guaranteed to be in perfect mechanical and operating condition. Same as new, price $600. Box 202, MoToR BoatinG.

For Sale—8 cylinder model FS8 Sterling 180 to 200 H.P., suitable for express cruiser or day boat. New spring 1919. Removed fall 1921, for twin-screw installation. Excellent opportunity. J. H. Bullock, 17 Franklin St., Greenpoint, Brooklyn, N. Y.

For Rent—Complete boat works and machine shop for sixty footers or under. Exceptional location near New York. Privilege of purchasing. Best location in America. Paine, 756 Broad St., Newark, N. J.

For Sale—Special 110 H.P. racing engine with nearby finish runabout hull and complete equipment. Ivan Kester, 642 3rd Ave., Clinton, Ia.

For Sale—One 25 H.P. two cylinder, 2 cycle Hubbard heavy duty marine motor with Paragon reverse gear and propeller, all fittings except shaft, $150; one 25 H.P. Lathrop, details like above, $150, both in good order. C. L. Hart, 60 Eastern Ave., Gloucester, Mass.

Wanted—Cabin cruiser to accommodate four. Give dimensions, equipment, draft, speed, power, price. W. B. Forman, Canajoharie, N. Y.

For Sale or Charter—New 50 ft. cabin cruiser, fully equipped. Price, $9,000. G. A. Roland, 14 Bittman St., Maspeth, L. I., N. Y.

Practically new 3 cylinder, 4 x 4½ Kahlenberg marine engine complete, with rear starter, magneto coils, etc., bronze wheel and force feed oiler. Just right for good sized cabin or work boat. First check for $250.00, plus transportation and crating takes it. C. M. Murray, 1306 Edanola, Lakewood, Ohio.

For Sale—35 H.P. brand new 2 cyl. heavy oil engine, complete propeller equipment at a sacrifice; location New York. Also new 22 H.P. 4 cyl., 4 cycle, valve in head gasoline motor and enclosed reverse gear for half price. Also 100 H.P. 4 cyl. Globe, first class running condition. Address Room 1357, 50 Church St., New York City.

Lighting Plant for Sale—One of the finest. Made by the Winton Company, Cleveland, Ohio. 4 cyl., 4 cycle Winton engine. Direct connected, 3 kilowatts, 110 volts, amperes 27.2. This plant can only be duplicated by buying from Winton Co. at the new price, so this is an opportunity to save money. Make your offers. Ford, 41 East 42nd St., New York, N. Y.

Wanted—A 4 or 6 cylinder 4 cycle engine; high speed type of 40 to 60 H.P. unit power plant preferred. Nothing older than a 1921 model will be considered. Write name of motor, weight, equipment, condition and price to Taylor's Boat Livery, Blodgett Landing, N. H.

Advertising Index will be found on page 126

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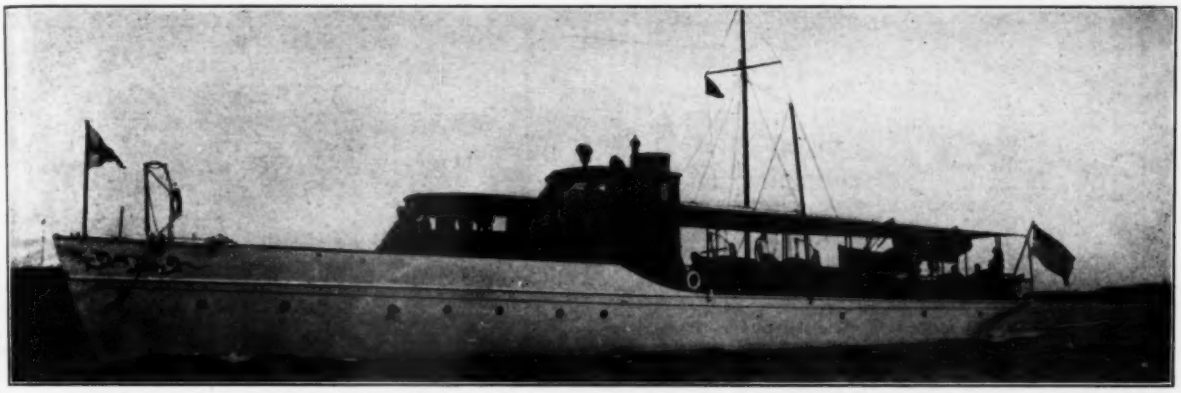
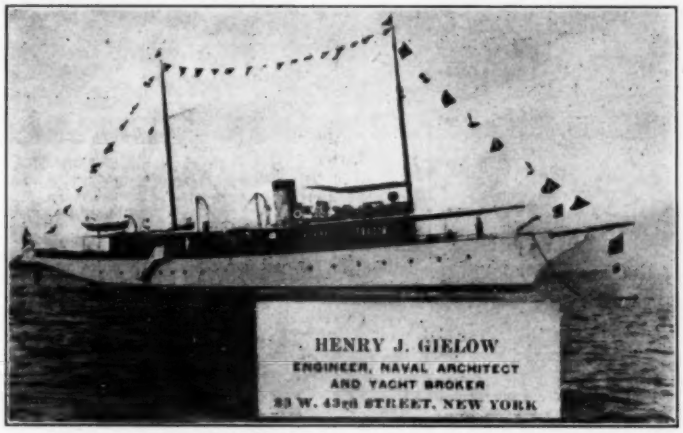


No. 7609—For Sale—At reasonable figure, this attractive 103 ft. twin screw power yacht. Large deck dining saloon, three double staterooms, two bathrooms. Two 6 cylinder Speedway motors, speed 13-16 miles. All in first class condition throughout. Further particulars from Henry J. Gielow, Inc., 25 W. 43rd St., New York City.



No. 9565—For Sale—131 ft. off shore cruising steam yacht. 3 double, 3 single staterooms; 2 deck houses containing dining saloon and social hall. Finished in red and white mahogany and birdseye maple. Inspectable New York. Henry J. Gielow, Inc., 25 W. 43rd St., New York City.

A few pair of very powerful and clear Bausch & Lomb Prism Binoculars, 6 x 30 power, complete with case, etc. Worth $75.00, will take $40.00. Percy M. Child, 1110 14th St., N. W., Washington, D. C.

One 70 volt, 75 amp. direct connected Winton four cylinder generating plant, worth $1250.00, will take $500.00. One 110 volt, 39 amp. direct connected Winton four cylinder generating plant, worth $1250.00, will take $600.00. One 110 volt, 15 amp. direct connected one cylinder Carlisle & Finch generating plant, worth $350.00, will take $175.00. One 18 in. Rushmore search lamp, 35 amp., deck type, will take $125.00. One set large galv. running lamps, both oil and electric, suitable for vessel up to 100 ft., complete four lamps, $20.00. Let me quote you on marine search lamps, all sizes. Percy M. Child, 1110 14th St., N. W., Washington, D. C.

TRIMOUNT WHISTLE BLOWER OUTFITS
Blower runs by friction contact with engine flywheel. Whistle of brass, nickel-plated.
Made in 3 sizes.

TRIMOUNT ROTARY HAND BILGE PUMPS
All bronze composition. Suction lift 6 to 20 feet. A lifelong convenience.
Made in 3 sizes.

TRIMOUNT ROTARY POWER CO.
20 Heath Street Boston, Mass.
(Factory: 292 Whiting Ave., E. Dedham, Mass.)

One cyl., two cycle

2 H.P. Perfection	$30
3½ H.P. Gray	45
6 H.P. Caille	65
8 H.P. Fairbanks	85

Two cyl., two cycle

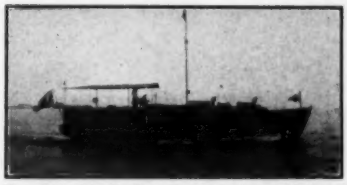
6 H.P. Gray	55
6-8 H.P. Gray U	95
8 H.P. Racine	65
10 H.P. Northwestern	85
12 H.P. La Crosse 3 cyl.	45
12 H.P. Straubel gear, heavy duty	145

Four cycle

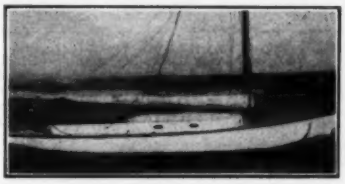
2 H.P. Dunn 1 cyl.	35
4 H.P. Dunn 2 cyl.	55
8 H.P. Dunn 2 cyl.	85
12 H.P. Lamb 2 cyl.	135
12 H.P. Doman 3 cyl.	145
16 H.P. Dunn 4 cyl.	165
20 H.P. new Erd 4 cyl.	225
24 H.P. Dunn 6 cyl.	185
30 H.P. new Doman 4 cyl 5 x 6	265
30 H.P. Automatic 4 cyl. 5 x 7	285
30-40 H.P. Red Wing unit plant	565

BADGER MOTOR CO., Milwaukee, Wis.

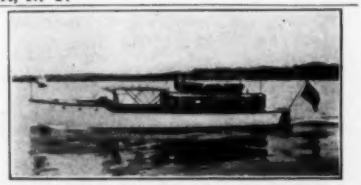
Extraordinary prices on motors! 10 H.P. Monarch, $40.00; 18 H.P. Rusky, $50.00; 4 H.P. Sintz, $20.00; 4 cyl. Buick, $45.00; 4 H.P. Palmer, $30.00; 4 H.P. Graves, $25.00; Sterling, Gray, Waterman and other motors, also reversing gears. Get our list. Jesick Boat Co., Grand Rapids, Mich.



For Sale—Desirable power cruiser; 37.6 x 8.6 x 2.10 feet; 25 H.P., 4 cylinder, Jager motor. Main cabin, double stateroom, full head room, hardwood finish, galley, toilet, ice chest, etc. Fully equipped, everything of the best. An unusual opportunity to get a most desirable craft. Price attractive. Laid up in Boston. Apply MoToR BoatinG, Box 201, New York City.



'CAPE-COD' Cruising sloop 35 ft. x 24 ft. x 11 ft. x 2 ft. All outside lead ballast. Brand new sails cost $625. Fully equipped. Sacrifice $1,000. 'ROSEMOND' Specialist Good Used Crosby Catboats. Widow's Hole Basin, Greenport, N. Y.



No. 1784—For Sale—Bargain. Day cruiser with enough accommodations for short overnight trips. 44 ft. x 10 ft. x 2 ft. 6 in. Construction and finish excellent. Pine decks, mahogany house and trim. Two berths in forward cabin. Large self-bailing cockpit with auto top and side curtains. Engine in forward part of house with plenty of room around it. Toilet room; berth for paid hand in separate room aft. Speed 9-15 miles. Apply John G. Alden, 148 State St., Boston.

For Sale or Trade—One 3 cyl., 2 cycle, 36 H.P. Gray Marine Motor, with full equipment, ready to run, for any thing of equal value. L. C. Edelblut, Augusta, Ga.

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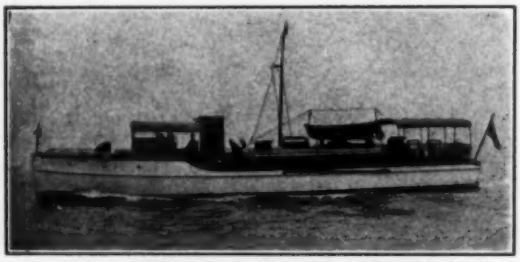
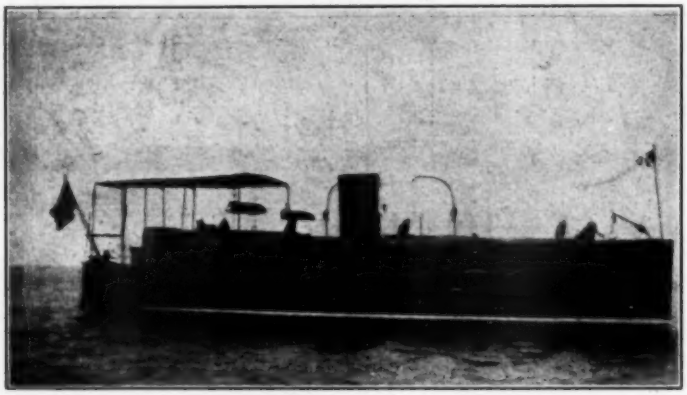


For Sale—Yacht Celeritus, 61 ft. O. L. x 11 ft. 6 in. x 3 ft. 9 in. Designed by Swesey. Built by Jacobs 1916. Redesigned 1919. Motors overhauled 1920. Power plant, two Sterling eight cylinders 150/200 H.P. each. New power dingey built 1920. Perfect order. Complete inventory. Price low. Apply Oliver, 417 Canal Street, New York.

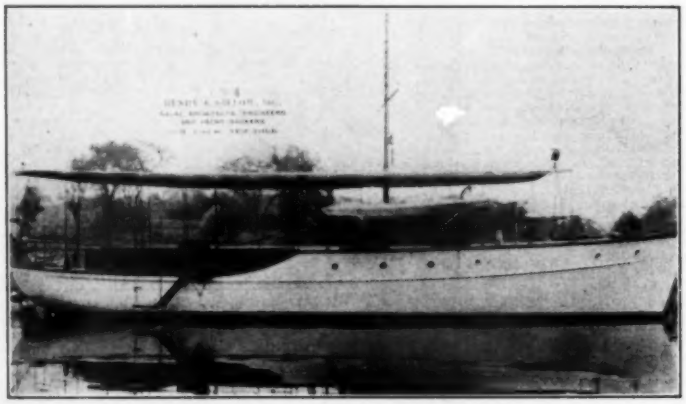
No. 745—For Sale, price reasonable—55 ft. bridge deck cruiser, beam 10 ft. 6 in., draft 3 ft. 6 in. Built 1917, and very little used. Forecastle with pipe berths and toilet for crew. Large galley. Saloon with toilet room, lockers, two transom berths. Engine room under bridge deck. Fine double stateroom and toilet room aft. Two 35-55 Sterling engines, run less than 500 miles. Speed 13 miles at 660 r.p.m.. Higher speed can be made economically if desired. Good equipment including two tenders. Apply John G. Alden, 148 State St., Boston.



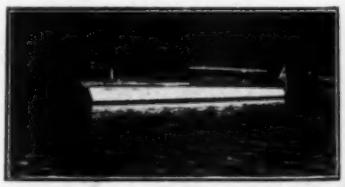
No. 7369—For Sale, Reasonable—Shadow ex. Cybele, 40 x 10 x 2.10. Modern cruiser built 1912, always well owned. Stateroom and saloon sleep five, berth engine room. 40 H.P. Sterling motor, self-starter. Speed 10-11 miles. Good sea boat, easily handled, excellent condition. Fully equipped including tender. Full headroom. Electric lighted. Henry J. Gielow, Inc., 25 W. 43rd St., New York City.

A BARGAIN EXTRAORDINARY

The motor boat COUNTRY LIFE, having successfully completed a cruise from Huntington, L. I. to Eastport, Me. and return, for which it was purchased, the owners are anxious to sell to avoid further storage charges. It is a 26 ft. Hand V-bottom runabout with 6 cylinder, four cycle motor. Speed 20 miles an hour. Completely equipped. Any offer considered. Write Editor, Country Life, Garden City, L. I., or phone Garden City 800.



No. 7194—For Sale—This heavily constructed able sea-going 60 ft. x 15 ft. 7 in. x 4 ft. 3 in. flush deck cruiser, built in 1916. Double stateroom full width of yacht, one single stateroom, bathroom, two toilet rooms. Sleeps 6. Heavy duty 75 H.P. Murray & Tregurtha Motor, new 1920. Speed 10-12 miles. Separate Delco lighting plant. All in excellent condition. Can be purchased at attractive price. Henry J. Gielow, Inc., 25 West 43rd St., New York City.



For Sale—31 x 6 ft. Runabout, solid Mahogany trim, six cylinder Buffalo engine, electric lighting and starting system. Removable top and side curtains. Speed about 30 miles. Perfect condition. Looks like new. Just painted and completely overhauled. This fine outfit complete for $2,500.00 cash. Would cost fully twice that amount to duplicate. George A. Schmitt, 1118 Webster Bldg., Chicago, Ill.

No. 1821—For Sale—V-bottom express runabout, 30 ft. x 6 ft. x 2 ft. High grade construction. 100 H.P. Sterling engine put in A-1 condition, late 1921 and hardly used since. Speed up to 30 miles. Apply John G. Alden, 148 State St., Boston.

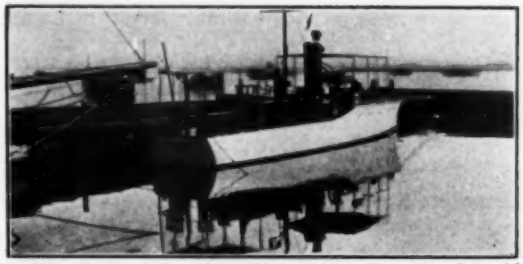
Advertising Index will be found on page 126

THE MOTOR BOATING MARKET PLACE

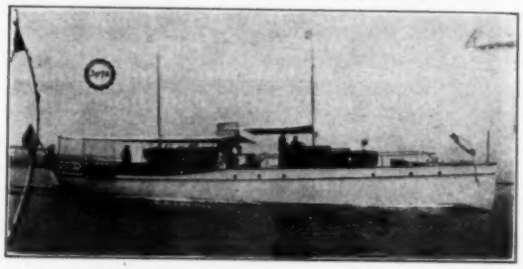
The rate for "For Sale" and "Want" advertisements is 6 cents per word, minimum $1.50. If an illustration is used, the charge is as follows, which includes the making of the cut:
Cut one inch deep, one column wide..... $ 5
Cut 1½ inches deep, 1½ column wide..... $10
Cut 2¼ inches deep, three columns wide..... $20

Opportunities for the Motor Boatman

Before you buy or before you sell examine the exceptional buying and selling opportunities under this heading. They comprise the best offers of the month. Please mention MoToR BoatinG.



For Sale—Bridge deck cruiser, V-bottom type 57 x 10 x 3.4, with 50 H.P. heavy duty Doman engine. Beautifully fitted up and completely equipped for long distance cruising. Ideal for Florida, being fitted with extra large tanks, refrigerator, galley, and full set screens. Has independent electric system, electric windlass and a lot of equipment not usually found in a boat of this size. Construction and condition first class. Immediate delivery. Very low price for quick sale. Apply to Rigg & Wetherill, Yacht Brokers, 1418 Walnut St., Philadelphia.



For Sale—Desirable 80-ft. twin-screw cruiser. Speed 13 m.p.h. Two double staterooms and one single stateroom; deck dining saloon. New equipment 1920. Price very reasonable. For inspection make appointment through Consolidated Shipbuilding Corporation, Morris Heights, New York City. Telephone Tremont 2800 or own broker.

For Sale—"Laura E", a splendid little bridge deck express cruiser designed and built by Wm. H. Hand, Jr., 1919, and now in perfect condition. Powered with an M-6 Van Blerck 125-150 H.P. motor installed with full automobile control. Electric lighting and starting. Speed 24 miles. Cabin for three with galley and toilet. A splendid seaboat. Owner has cruised off-shore successfully for swordfish. Length 33 ft.; beam 8 ft.; draft 2 ft. 9 in. Price $5,000. William H. Hand, Jr., Naval Architect, New Bedford, Mass.

4 cylinder Hall-Scott motor, with Dixie magnetos, Zenith carburetor, air water pumps, starting bracket. $150. New 17 x 32 Hyde wheel, $10. L. B. Green, 152 S. Hamlin Ave., Chicago, Ill.

Motor Boat Fan now traveling Florida would like to go North with someone in their motor boat. Willing to share expenses. Best of references. (Permanent address.) F. C. Osborn, 168 S. Third St., Columbus, Ohio.

For Sale at a Bargain—4 cyl. Van Blerck; 100 H.P., Bosch dual 2 point ignition, Joes rear starter, bulkhead type, complete unit-power plant; condition perfect, guaranteed. Apply Box 203, MoToR BoatinG.

For Sale—6-cylinder Sterling, Type FM, 85-135 H. P., 5½ in. bore, 6¾ stroke. Fine condition, ready to run. Just overhauled, carbon cleaned, valves ground, etc. Used only two seasons. Wonderful bargain for cash. Selling because it is faster and more powerful motor than my boat requires. Write for details and price. W. H. Kissam, 120 Broadway, New York.

For Sale—Two twenty by six Mullins, air compartment, non-sinkable, steel auto boats. Equipped complete with auto top, brass rails, kapok cushions, nine-twelve horse power Universal motor. Are in first class condition, having seen only three weeks' service. Only reason for selling is that owners do not find them large enough for their requirements and are buying larger boats. Address E. A. Burch, 205 West 3rd St., Oil City, Pa.

Advertising Index will be found on page 126

THE MOTOR BOATING MARKET PLACE

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Cut one inch deep, one column wide	**$ 5**
Cut 1½ inches deep, 1½ column wide	**$10**
Cut 2¼ inches deep, three columns wide	**$20**

Terms: Cash with order.

Opportunities for the Motor Boatman

Before you buy or before you sell examine the exceptional buying and selling opportunities under this heading. They comprise the best offers of the month. Please mention MoToR BoatinG.

For Sale—This 45-ft. Rochester cruiser, built 1920. Equipped with six cylinder Sterling. Cost $16,000, will sell for $10,000.

One 40-ft. open bridge Rochester cruiser, built 1919. Equipped with six cylinder 150 H.P. Van Blerck motor. Cost $12,000, will sell for $7,500.

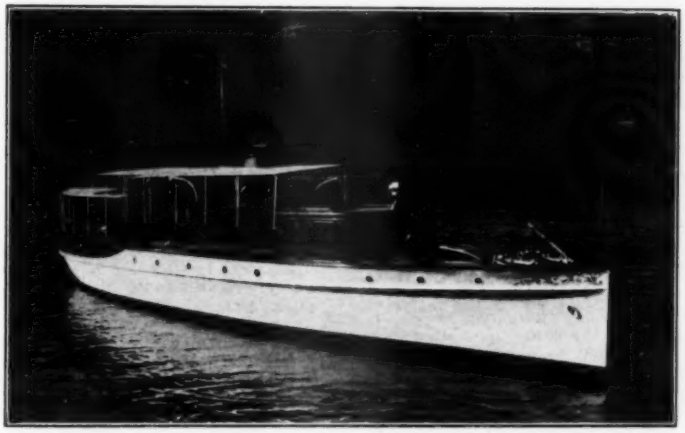
One special 45-ft. Rochester enclosed bridge cruiser, built 1919. Equipped with six cylinder 120 H.P. Van Blerck motor. Cost $16,000, will sell for $9,000.

One Ditchburn 28-ft. runabout, four cylinder valve in head Gray. Cost $4,000, will sell for $2,000.

Prices reduced on all new Rochester cruisers.

For further information inquire Rochester Boat Works, 10 Charlotte Sta., Rochester, N. Y.

No. 7811—For Sale—Attractive Seabury express day cruiser, speed 20-22 miles. 55 x 8.9 x 3. Electric lights, saloon, two berths, galley, two toilets. Mahogany and white finish. Exterior mahogany. 8 cyl. 200 H.P. Speedway. Boat and motor thoroughly overhauled and equipment new 1920. Steers from enclosed bridge. Price low. Inspectable Baltimore. Henry J. Gielow, Inc., 25 West 43rd St., New York City.



For Sale 688. Elegant twin-screw coast cruising gasoline yacht. 70 o. a., 12½ beam, 3½ draught. Two double staterooms; deck dining saloon; bathroom. 20th Century motors; speed 13 miles per hour. Unusually completely equipped. Here is the best opportunity ever offered to purchase the finest yacht of her size and type available. Every modern appointment and absolutely in first class condition—good as new. Very attractive price for immediate sale. Full details from Simon Fisch, Yacht Broker, 185 Madison Ave., New York. Telephone Vanderbilt 3877.

No. 7230—For Sale—At attractive figure, 52-foot express cruiser. Speed up to 21 miles. All first class condition. Owner anxious to sell. Sleep 8. Henry J. Gielow, Inc., 25 West 43rd St., New York City.

Position wanted by licensed Chief Engineer of 300 gross tons for gas, oil, naphtha and Electric motors, also an auto mechanic and a handy man with carpenter tools. Would consider a steady position with some good party. Reference furnished upon request. Emil E. Stienback, Rudyard, Michigan.

Wanted—4 cyl., 5 x 6½—24 H.P. Standard Engine. State particulars and price. Address Box 200, MoToR BoatinG.

2 H.P. Evinrude outboard motor, run 50 miles, new. Special outboard motor boat 14 x 5 new last season, newly painted. Reason for selling getting larger boat. Price complete $160.00. Donald S. Garde, Cromwell, Conn.

For Sale—Bridge Deck Cruiser 40 ft. x 10 ft., fully equipped, self starter, electric generator, seaworthy—bargain. Wm. Bowman, 317 Winslow Ave., Buffalo, N. Y.

For Sale—32 H.P. Wolverine $700—35 H.P. Automatic $800—37 H.P. Standard $800—Three 65-75 H.P. Standard $1200 each—75 H.P. Craig $1200—75 H.P. Automatic $1200. Ed. Keil, Simpson Boat House, 151st St., North River, N. Y.

For Sale—40 ft. x 9 ft. 6 in. mahogany glass cabin cruiser 30 H.P., 4 cylinder, 6½ x 8 Murray & Tregurtha engine. Brass fittings, bright finished decks, a very handsome boat. Price $2500.00. Address Crilly, 1233 Real Estate Trust Bldg., Philadelphia.

Have your boat engine perfectly over-hauled or rebuilt; installed with a guarantee. Rebuilt engines for sale. Dolland, 236 W. 137th St., New York City.

For Sale—4 cylinder, 5 x 6 medium duty, Van Blerck motor. Used very little and absolutely guaranteed in A1 condition, including clutch, $400. L. A. Ohlemacher, c/o Fred Groch Coal Company, Sandusky, Ohio.

Portable Phonographs—Specially made for Motor Boating and outdoor use. Easily carried about. Dimensions when closed 1 ft. x 1 ft. 6 in. Plays all records full tone. We send C.O.D. Postpaid. Further information write to Long Island Piano Exchange, 796 2nd Ave., Astoria, L. I.

For Sale—Hacker design 28 x 6 ft. Albany runabout; 6 cylinder 5½ x 6 125 H.P. Van Blerck, electric starter. Will sell engine separately. F. W. B., 263 Scholes St., Brooklyn, N. Y.

Wanted — Lavatories, folding and pedestal; toilet with 3 or 4 inch pump cylinder (also small toilet); copper tinned water tanks about 12 in. x 2 ft. x 3½ ft. or longer; gasoline copper tank about 100 gals. (or more) to fit side of boat; small power Capstan or windlass; 32 volt fans; bronze rudder, about 2 in. stock; bronze R. H. Hyde propeller 28 in. p., 36 in. diam.; 25 ft. mast (hollow preferred); spars; rigging, etc.; small mahogany or teak skylight (also hatch); cabin windows, heavy mahogany or teak, about 18 in. x 24 in. outside (state size); 8 in. or 12 in. port lights; galvs. fluke anchor, 200 lbs.; also mushroom 500 lbs., and ⅜ in. and ½ in. chain; galvanized yacht davits, 3 ft. swing, about 7 ft. or 8 ft. long; galvanized stack, square or oval, about 18 in. x 2½ ft. x 5 ft.; all in first class condition. Address Apt. 61, 44 W. 44th St., N. Y. City.

Yard and Shop

(*Continued from page* 44)

its engineer, had to pay particular attention to the great weight of the merchandise to be stored.

Hess Motors in New York

The single cylinder Hess motor made in a 4-5 h.p. unit is now represented in New York by the G. H. Masten Co., 222 East 46th Street. This motor, which is manufactured in Algonac, Michigan, is a sturdy little machine which uses some parts interchangable with those of the Ford motor. It is furnished with various equipments, such as different types of ignition and an assortment of clutches. Its bore and stroke are 3¼ by 4 inches and at 925 revolutions it delivers its rated h.p.

New Fay & Bowen Motor

Some interesting details of marine motor construction are disclosed in the new model LN 41 Fay & Bowen marine engine. A great deal of thought has been expended on the cams and a design has been effected which has reduced the noise of contact between the cam and valve lifter. The cams have been forged integral with the shaft resulting in larger diameter of shaft and making possible the elimination of the central bearing. Longer life is insured by reason of their greater face width than is usual.

The gear type of oil pump has been adopted in place of the plunger type which gives a continuous flow of oil to the various bearings and reduces the fluctuations of the oil gauge. The pump is removable from outside the engine without disturbing any other parts. A large and heavier fly-wheel makes for smoother running at lower speeds.

The installation of the electric starter, magneto, etc., on the outside of the engine has been so designed as to make a very substantial mounting so located as not to interfere with the proper inspection of the working parts of the engine itself, at the same time giving an adjustable feature to the motor-generator which makes it possible to keep it in perfect alignment and take up slack as becomes necessary. The cam shaft and magneto and water pump shaft are driven through fabric gears. This further reduces the noise of the engine. Another important improvement is the redesign of pistons and rings which has enabled us to show a very material reduction in oil consumption at the same time giving ample lubrication of the cylinder walls.

The Tvedt Adjustable Muffler

The Tvedt & Smith Co., of Cherry Valley, Mass., has taken up the manufacturing of the Tvedt Adjustable Muffler, designed during the war for the use on high speed patrol boats. It became widely known on account of its merits, taking care of the largest high speed engines ever built, and was sold in quantities to the different governments. It was later patented and perfected for commercial purposes and has been successfully installed in a large number of private pleasure boats.

The main object of this device is to increase the efficiency of mufflers for all of their uses and particularly so to construct a muffler, that when applied to an engine of an approximate size, it may be adjusted to overcome the variations that often appear in the different types and makes of motors.

Advertising Index will be found on page 126

Another great feature with the Tvedt Adjustable Muffler is, when once installed on an engine, it will not be necessary to remove the muffler to improve the condition, as it may be adjusted while in place.

Hall-Scott Appoints Montreal Distributor

The Hall-Scott Motor Car Co. of Buffalo advise that the Semmelhaack-Dickson, Ltd., who have their show room and service department at 333-337 St. James St., Montreal, Que., have been appointed distributors for the famous Hall-Scott Marine Engines for the Province of Quebec and adjacent territory.

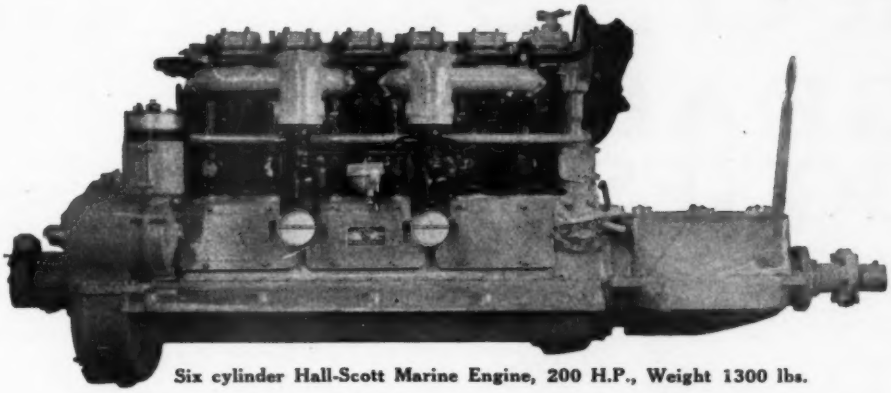
Percy Semmelhaack, the aggressive and popular General Manager of this company, realizing the need of a reliable and strongly built engine of moderate weight for his clientele, immediately purchased one of the six cylinder 200 H. P. Hall-Scotts and now has it on display in their show rooms. This is a duplicate of the power plants of Adieu, Nick Nack, and other record breaking boats.

The Semmelhaack-Dickson, Ltd., in addition to handling Hall-Scott Marine Engines also sell and distribute Universal, Scripps, Frisbie and several other well known makes of marine engines.

Nick-Nack, a Fast Runabout

In order to compete in the Fisher-Allison race at Buffalo, Comm. Humphrey Birge of the Buffalo Launch Club commissioned John L. Hacker of Detroit to build for him a fast runabout to be eligible for this race. Through various delays it was not completed in time to be ready for the races at Buffalo and it first competed in the Wood-Fisher race at Detroit. The six-cylinder 200 h.p. Hall-Scott motor with which it is equipped drove it remarkably well throughout the races, many records having been broken in the course of the several events. A two and one-half mile lap of the course was done at the rate of 42.15 m.p.h. Fifty miles were run in 1:12:31 or an average of 41.3 m.p.h. This speed was better than was made by more powerful boats equipped with twin screws.

The Hit of the Show



Six cylinder Hall-Scott Marine Engine, 200 H.P., Weight 1300 lbs.

THE most talked of engine at the New York Motor Boat Show was the Hall-Scott. The most attractive boats exhibited were those powered with Hall-Scott engines.

Marathon, the 30-ft. Sea Sled runabout that does 46-47 miles per hour with a pair of 200-H. P. six-cylinder Hall-Scott,—Belle Isle Bearcat, the 26-ft. standardized runabout from Detroit,—the Red Bank 26-ft. mahogany runabout,—these were the outstanding examples of recent progress in the building of fast boats.

In cruisers as well as runabouts, Hall-Scott Marine Engines have demonstrated their ability to develop high power and high speed continuously without the delays and troubles usually experienced with fast turning engines.

4 cyl., 125 H.P., Weight 1100 lbs. 6 cyl., 200 H.P., 1300 lbs.

Write today for descriptive catalogs.

Single and Twin Screw Plants in stock at

HALL-SCOTT MOTOR CAR CO., INC.

Eastern Sales and Service Branch, 887 Niagara St., Buffalo, N. Y.

Factory: Berkeley, Calif.

A fleet of Belle Isle Bear Cats, all powered with 125 H.P. Balanced Four Hall-Scott Marine Engines.

Know Your Engine

(*Continued from page* 13)

cooling purposes, this is called the water jacket.

Fig. 4 shows pistons of different shapes. They, like the cylinders are castings and usually made of cast iron, sometimes of semi-steel and in some cases of aluminum, or its alloys. The walls are quite thin (a) but to insure sufficient strength on the top where the effect of the explosion is so great, ribs (b) are added. Near the top are grooves going all around the piston into which the piston rings find their home and just below the piston ring grooves, is the round hole (d) in which the wrist pin works.

Pistons 1 and 2 at the left end are used in the two stroke cycle engine while the others are used in the 4-cycle engine, their principal difference being the piston rings (f) at the bottom of the piston and the projection (e) on the top of the piston called a deflector. Number 3 piston has a concave top, Number 4 a convex, round, or dome head and piston Number 5 a flat head which is almost universally used in 4-cycle engines. Note that it has three piston rings (c) at the top and oil grooves at the bottom, and that the piston is turned or cut a little smaller in diameter at (h) so that if the expansion is not uniform the piston will not rub the cylinder walls. The two bosses (k) serve to hold the wrist pin.

Piston rings are made of cast iron, machined all over and must be carefully fitted to the grooves around the upper end of the piston. The rings fit the grooves snugly, but not so tight that they can not move freely. They are cut from castings a little larger in diameter than that of the piston. A piece is cut out of the ring leaving a gap as indicated at a, b, c, Fig. 9. The ring is then compressed so that the two ends meet, held in this position and ground to a true circle on the outside so as to fit the cylinder in which it is to work. There are several ways in which the laps or joints in the rings are made, the most common being (a) diagonal cut, (b) lapped joint and (d) one form of what are termed leak proof rings.

The wrist pin or piston pin as it is sometimes called is always made of steel and is round or cylindrical in shape and fits closely the bosses in the piston, and may be either hollow or solid. It is machined, hardened and ground accurately to size.

Connecting rods are steel drop forgings, or bronze, and even malleable iron castings have been used. Fig. 12 shows some of the more conventional forms as used today. The upper end is called the wrist pin end and the lower end the crank end. The bolt on No. 2 permits clamping or holding the wrist pin thus making the pin move in the bosses of the piston whereas in Nos. 1 and 3 the wrist pin is fastened to the bosses in the piston and the connecting rod moves freely on the wrist pin, so that the connecting rods must in this case be provided with bearing, but in No. 2 no bearing is required for the wrist pin. In No. 1 the crank bearing has not been put in place as it is in No. 2 connecting rod the bearing is made in halves one half in the connecting rod and the other half in connecting rod cap (a). No. 3 is a type of connecting rod used only in heavy duty work.

Crankshafts are always made of steel and generally drop forged because they are one of the most vital parts of an engine and the punishment they receive is very severe. Fig. 13 shows a 4-cylinder 4-cycle crankshaft because there are four crankpins (A) or points to which connecting rods are to be attached. The crankshaft for a 1-cylinder engine would have but one crank pin, and for each additional cylinder used an additional crank pin is required. The main bearings (B) are the points at which the crankshaft rests in the crank case. In some engines there is a main bearing between each crank of the crankshaft instead of between each two as shown in Fig. 13. (C) is a timing gear and (D) a flange to which the flywheel is bolted.

The flywheel Fig. 2 is merely a piece of metal the weight and distribution of which are required to give smooth operation of the engine. Some have a heavy rim with spokes and in a general way look like an ordinary belt pulley, while others have a solid web. They may be made of any kind of metal that has weight but cast iron is generally used. The weight of the flywheel varies according to the number of cylinders of the engine and the work it has to do.

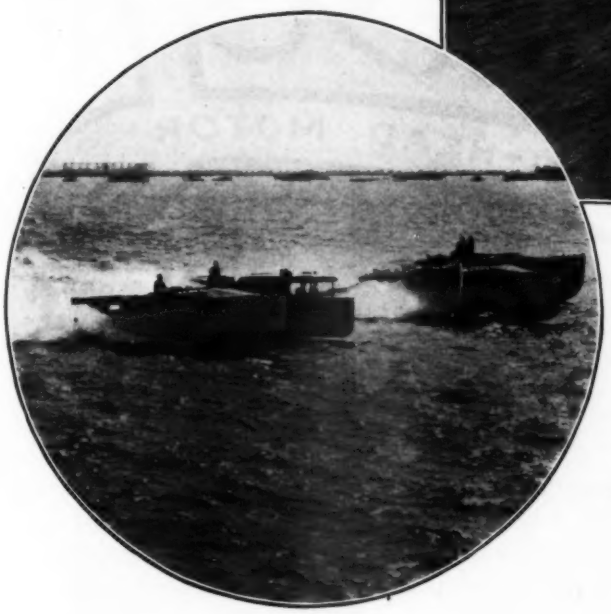
Next to the crankshaft the most important part of the power plant is the substantial way in which the crankshaft and cylinders are securely held and fastened to the bed plate of the boat, this is done by a casting called the crank case, the name indicating that it is a case enclosing the crankshaft. It is made of bronze cast iron and in some places of aluminum. Salt water will attack aluminum and therefore its use is limited for marine work to places where salt water can be kept away. Fig. 11 shows a crank case for a 4-cycle engine and Fig. 15 the oil pan which is bolted to the bottom and which acts as a reservoir for lubricating oil.

The various parts of this may be designated according to the letters shown on Fig. 11. The main crankshaft bearings are marked A. The cylinder block holding down studs are marked

(*Continued on page* 68)

They're off at MIAMI

Watching some thrilling motor boat races at Miami Beach.



Annual Motor Boat Regatta
March 2nd to 9th
including the Fisher-Allison Trophy and the Wood-Fisher Trophy Races.

Boating, bathing, fishing, motoring, golf, polo, tennis, dancing,—all of these are at their best at Miami Beach.

YOU enjoy every minute of the day, every day of the season, if you spend your winter at Miami Beach. It is ideal for rest or recreation because it combines great natural advantages of climate and surroundings with every modern facility for comfort and pleasure.

Not only a hotel resort but also a place for permanent homes, Miami Beach is every year adding to its colony of notable winter visitors and year around residents.

A home of your own at Miami Beach will increase your enjoyment of life. Desirable modern homes are available, and the property is beautifully laid out and carefully restricted. Full details will be mailed on request.

Write for booklets and complete information. Address

CARL G. FISHER
MIAMI BEACH FLORIDA

Gray

VALVE-IN-HEAD MOTOR

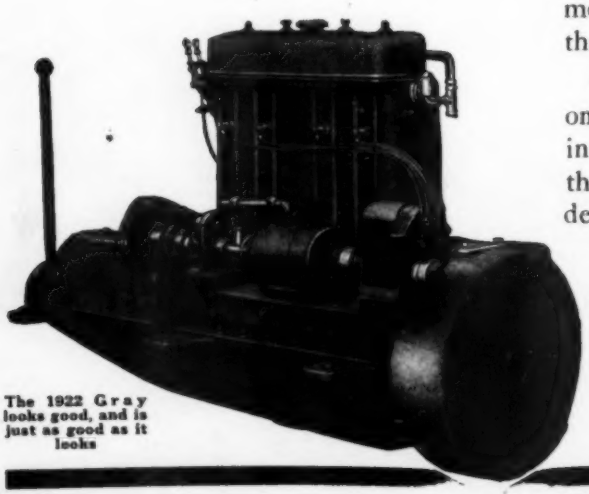
The Motor News of 1922 —

THE big news of the season in the marine motor market is the new 1922 model Gray 10-25. A refined motor that has been perfected after three seasons of general service in hundreds of motor boats—a real marine engine that meets every requirement of marine service,—this is the power plant you want for your new boat, *at the price you want to pay.*

Remember, this is not a brand new design, still awaiting the test of actual service and the approval of boat owners. It is a development and improvement of our popular VM model which has already established its place as one of the most successful, best selling marine motors ever built.

Our success with the predecessor of the 1922 Gray has warranted us in putting this motor into large production,—warranted us in tooling up our big motor plant with special equipment for producing this motor more economically and efficiently than any smaller factory could build it.

Gray is one of the oldest marine motors on the market. It is the best known, used in every part of the world. We have one of the largest and best equipped plants ever devoted to the production of a marine motor.



The 1922 Gray looks good, and is just as good as it looks

No wonder the 1922 Gray at a 1922 price presents the biggest value for your money ever offered in a marine motor of its size.

Advertising Index will be found on page 126

A Better Engine for Your Boat

Neat, compact, every moving part enclosed, you'll find the 1922 Gray as handsome and as efficient as any motor of its size ever built, regardless of price

THE 1922 Gray is neat in appearance, compact, and can easily and inexpensively be installed in runabouts 20 to 30 ft. in length; small cruisers up to 34 ft., also work boats.

Note the rigid one-piece base with Reverse Gear enclosed. The gear is automatically lubricated with positive gear pump that lubricates all other internal working parts of the engine—no grease cups or thick transmission oil used.

Oil filler is conveniently located on *top of engine* with duct leading to Crank Case. Rocker arm shaft is hollow and automatically supplies oil to Rocker Arms. Oil is forced under pressure to the three main bearings, and to the connecting rod troughs.

In brief, the Gray Oiling System leaves nothing to chance. It is unfailing at all engine speeds, and all oil is kept inside the engine, and not thrown around the boat or on its occupants.

The fly wheel is enclosed, affording safety and cleanliness. Bilge water cannot be thrown by the fly wheel. Every working part is enclosed; even the push rods. Due to the special design of the Cam Shaft, push rods and rocker arms, scarcely a sound can be heard with ear close to the engine.

The smooth, quiet operation of the new Gray improved Valve-in-Head at all speeds from 200 to 2000 would compare favorably to an electric motor. It runs most economically on low grade gasoline and satisfactorily on kerosene.

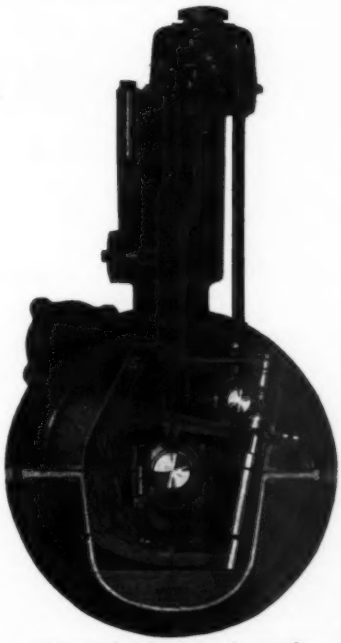
Note The Big Crankshaft

The diameter of the main bearings are: Front 2⅛". Center 2 1/16". Rear 2". The lengths are 3⅜", 2½", 2½" respectively. Crankshaft is 40-50 point carbon steel forging, heat treated and ground.

Special attention is given to the balancing. The shaft is put in rotative as well as static balance on an Akimoff Dynamic Balance Machine, reducing vibration to a minimum.

Bosch Magneto with Impulse Starter, also Bosch two unit Starter and Generator is used.

Gray Two-Cycle Motors are built in models from 3 to 8 h.p.

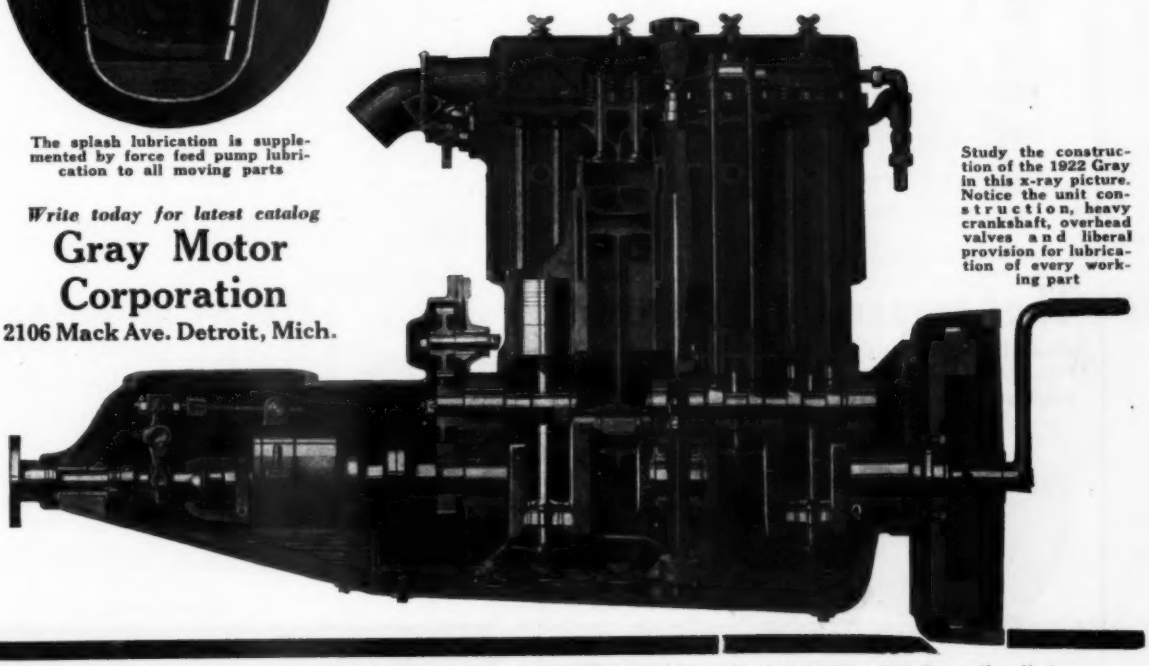


The splash lubrication is supplemented by force feed pump lubrication to all moving parts

Write today for latest catalog

Gray Motor Corporation

2106 Mack Ave. Detroit, Mich.



Study the construction of the 1922 Gray in this x-ray picture. Notice the unit construction, heavy crankshaft, overhead valves and liberal provision for lubrication of every working part

Splitting the Seconds

(*Continued from page* 23)

will give the time to the one-hundredth part of a second. Operating the printing coils is a hand trap or push button having a closed contact, this being in series with a relay operating the printing coils.

The foregoing may seem somewhat technical but I have tried to give the details of the machine in answer to the many requests we have had as to its operation. In Detroit we had a man on the timing boat wig wagging signals to some naval officials. He reported the times of the laps by one-hundredth seconds and the signal came back, "Where do you get time like that?" We told the signal officer and within a few minutes came a request for the naval officers to come aboard and inspect the machine. The demonstration convinced them that it was possible to time a race accurately to the hundredth of a second.

The big idea back of the electrical timing device, however, is the elimination as far as possible of depending upon the human equation, and the absolute check which it offers as to the time of every boat on every lap of a race of any length. Official records are really official and records when timed in this manner.

Know Your Engine

(*Continued from page* 64)

B. Openings for the piston C. The points marked D are the housings for the camshaft bearing which runs through the casting on this line. The opening for admitting oil into the base pan is marked E, while the supporting bracket G has openings for holding bolts marked F.

Liberal size hand holes in the sides of the crank case are very desirable so that the main bearing A and the connecting rod bearings may be reached for inspection and adjustment. The cylinders set on top and are bolted or held down by use of stud bolts B. The arms G are used to fasten the engine to the bed timbers by lag screws passing through holes F.

The oil pan is sometimes called the lower half of the crank case, but this is not correct unless the crankshaft and main bearings are held therein. Fig. 15 shows the oil pan for a 4-cylinder engine with the oil sump A or place for a quantity of oil to be kept and the dipping troughs B. This will be referred to later under the subject of lubrication.

The Motor Boat Show of 1922

(*Continued from page* 9)

the boat were so closely figured that if, on its transit of New York City, there had been a snowfall of three inches, it would not have passed under one of the elevated structures. However, it arrived safely, and the hundreds of motor boat enthusiasts who climbed aboard it saw it apparently ready for instant operation, and complete from the artificial flowers in the owner's cabin to the artificial fruit in the dining saloon.

Another novelty which commanded a deal of interest was Lightnin', the electrically propelled 40-footer built by the Davis Boat & Shipbuilding Corporation. Two Universal generator sets are installed on the bridge deck—one on either side—and because they deliver their power to an electric motor rather then to propeller shafts, they can be placed near the sides of the boat where they are out of the way. Transom seats cover them, and, except for the slight hum of operation they are as unobtrusive as they are inconspicuous. The electric motor is placed forward of the bridge, together with the rheostat, by which the speed of the boat is controlled, and other power accessories. A feature of Lightnin' is the balsa wood with which her bilge compartments are filled. Balsa is used in sufficient quantities to float the weight of engines and passengers, and the boat is therefore unsinkable.

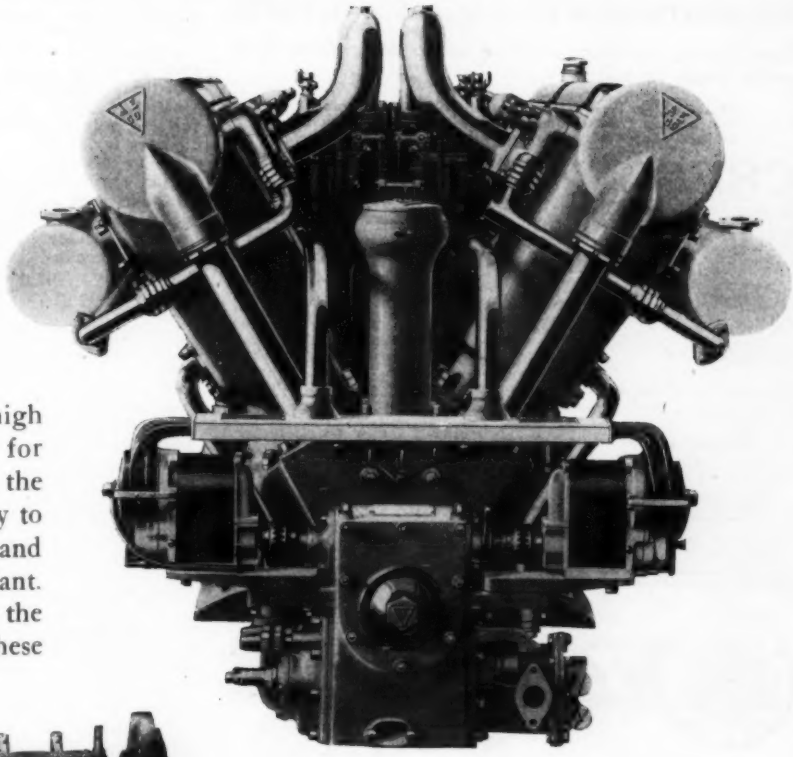
Inasmuch as the Motor Boat Show opened its door on the coldest day of the winter, it was natural that the crowd should

(*Continued on page* 84)

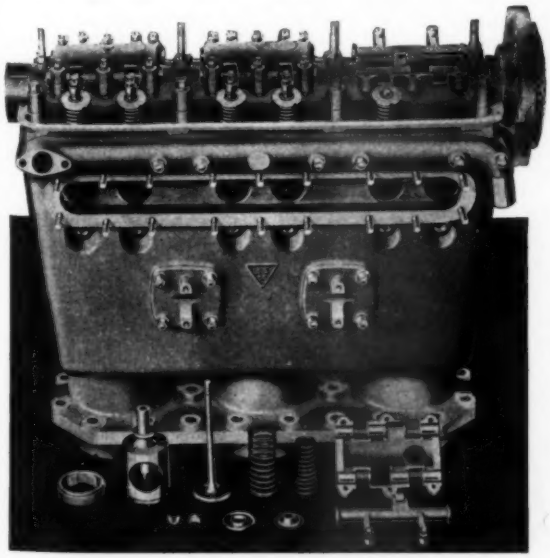
Advertising Index will be found on page 126

ALLISON

The ALLISON was designed with the aim of not only producing a better marine engine than had ever been built, but also of producing the best marine power plant that engineering skill could create. Its performances have already demonstrated that this end has been achieved.



In fast motor yachts and high speed runabouts of the class for which this motor was designed the matter of first cost is secondary to the reliability, silent operation and fuel economy of the power plant. There are definite reasons why the ALLISON is supreme in these respects.



A cylinder unit of the Allison Twelve, cast three enbloc. This view shows the overhead camshaft, overhead valves and removable valve cages. Four valves in each cylinder, two springs on each valve. Three spark plugs in each cylinder, fired by three separate ignition sources

The design and construction of this motor are as out of the ordinary as you would expect in a motor selling for $25,000. It is produced by successful business men who are thoroughly conversant with automotive engineering as well as with the requirements of marine service. Yachtsmen who want and can afford the best will find in the ALLISON a truly ideal marine power plant.

Let us send you the complete details and specifications.

Allison Engineering Co.

Indianapolis Indiana

In Search of the Treasures of Treasure Island

(*Continued from page* 18)

Our passage through the Canal, though interesting, was without incident. We arrived at the Pacific terminal on the afternoon of July 14, the great French National fête day corresponding to our Glorious Fourth, deleted of late years. We were in time to see the tail end of the ceremonies in honor of General Mangin, who had just arrived in the French battle cruiser, Jules Michelet. He was then on his way to Callao, Peru, to represent France at the Centennial celebration of their liberation from Spanish rule. It was this very liberation, one hundred years previously that was also the direct cause of our being in the same waters with Mangin.

At the Canal two other hopeful gold-diggers joined us, having come down by steamer from New York, so as we headed out into the Pacific our little yacht was a bit overloaded with personality. Eating and sleeping in relays, though hardly comfortable, solved the question of how eight people could occupy quarters for six.

Up to this time things had gone pretty well, but once in the Pacific, our troubles began. The weather was awful, with rain, rain, and then more rain, day in and day out, morning, noon and night. Added to that we were bucking a head wind and head sea that forced us to sail hundreds of miles out of our course, proceeding along the northwest coast of South America rather than heading direct for Cocos Island. For days at a time we were unable to take a sight and had to guess our position as best we could. At least, most of us frankly admitted we were guessing, but the captain would admit nothing of the kind. The best he could do with his mass of interminable figures and hours spent braced against the rigging squinting through the sextant, was to place us once in the mountains of Colombia and again in the foothills of what must have been wonderful pasturage for cows but hardly the place for the bulwarks of our ship.

Sensing the extreme confidence we had begun to feel in his ability as a navigator, he resorted to the Tahitian and Marquesan languages in making his notations on the charts. It was fairly amusing at first but after a week of this playing "blind-mare" in the Pacific Ocean, wet to the skin as a steady diet and with four now of the outfit too sick to hold their heads up, our tempers were set a bit more on edge by our first real and serious accident.

It had been pouring rain as usual all day but had let up for a short while, enough to make it pleasant on deck. The light puffy breeze had died out altogether. I was below at the time, shaving, and had removed the alfalfa from the west side of my face when suddenly, without a second 's warning, a terrific squall caught us from the lee side, snapped the boom tackle like nothing and sent our enormous mainsail over to port with a crash that splintered the boom between the two bands and heeled Adventuress over till the port side of the deckhouse was clean under water.

The broken boom and half the mainsail dragging in the sea kept her over at a dangerous angle, but quick work with the axe cleared enough wreckage away to let her right herself. By this time all thought of shaving was clear out of my head and did not return for two days. It was blowing great guns, raining pitchforks and every sail on the boat was torn and snapping in the driving rain. Our deckload of gasoline, together with a brand new case of canned cherries, was swept overboard, but the unsolvable mystery is how the motor launch on the port side managed to stay put. In spite of the fact that at the most we were only a couple of hundred miles north of the equator we were all chilled to the bone and as we worked, our teeth were chattering fit to knock the fillings out. Believe me, we badly needed the hot coffee that Mrs. Seabury hurriedly made to warm us.

In the cabin everything movable had shifted, making the wreckage there nearly as disheartening as on deck. Precious sugar, coffee, and flour were dumped about the galley floor; photographic chemicals, plates, kerosene, and toilet articles decorated the main cabin, and everywhere, everything was wet and soggy. After two days spent in clearing away the mess we broke out our heavy awning canvas and rigged up a jury sail on the foremast. This, the jib topsail and the engine brought us finally into harbor at Coiba Island, 200 miles west of Panama.

On this lonely island, otherwise uninhabited, is the model penal settlement of the Panamanian Government where several hundred supposedly hard criminal characters, largely murderers, live under a strict but ideal rule. It was indeed strange to find this small colony of human beings, cut off from and practically forgotten by the world, presided over by the dominant personality of a typical, great, big American, standing 6 feet 2 inches, weighing 230 pounds, quiet and efficient, unquestionably just and by the strength of his character ruling a settlement of criminals as easily and peacefully as if it were a denominational summer camp for boys.

(*Continued on page* 88)

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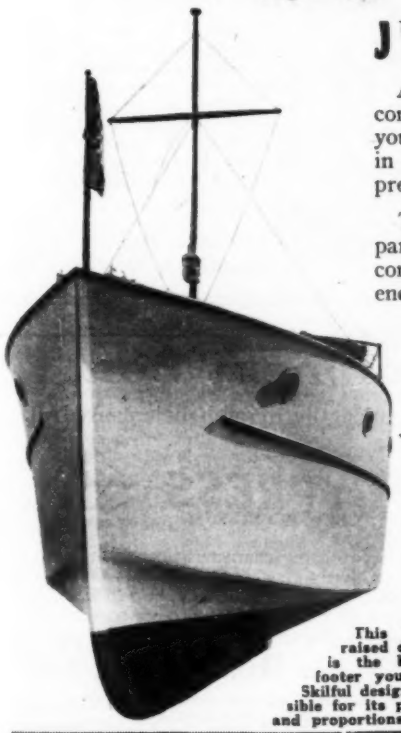
The Cruiser Sensation of 1922

$1500
Completely Equipped

DELANCO 27

The Delanco 27. Length 27'. Beam 8' 6". Draft 2' 6". Speed 9 miles



This V-bottom raised deck cruiser is the biggest 27-footer you ever saw. Skilful design is responsible for its perfect lines and proportions.

JUST think of it! A well designed, well built, well finished motor cruiser, equipped complete to the last detail, all for $1500.

A boat you can handle alone, big enough to entertain a party of eight or ten, complete enough for a month's cruise, fast enough to pass most of the cruisers you meet. An up to the minute V-bottom raised deck cruiser that lacks nothing in accommodations or appointments, furnished all ready to cruise at a real pre-war price.

The Delanco 27 is designed and constructed by experts. The plans were prepared especially by J. Murray Watts, the celebrated Naval Architect. The construction is carried on in our well organized boat building plant by experienced boat builders under expert supervision. Standardization and quantity production have cut the cost in two!

Delanco 27 is a good sea boat, staunchly built, easy driving, easily handled, dry and safe to navigate in any weather. Steam bent oak frames spaced 12" on centers, planked with white pine, well caulked above and below the water line,—these things insure a hull that will last a lifetime, and ride a gale without springing a leak.

You'll find the Delanco 27 your ideal of a small cruiser,—ideal in appearance, comfort, arrangement, equipment and service.

Order now for Spring. Deliveries by water or rail, anywhere. Write today for detailed specifications.

Delanco Shipbuilding Company
Delanco, N. J.
(On Delaware River near Philadelphia)

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The Motor Boat Show of 1922

(*Continued from page* 68)

have flocked around the 31½-foot ice boat exhibited by the Evinrude Motor Co. Strictly speaking, it had no place in a motor boat show, but as an example of art in building as well as a novelty which drew attention to the outboard motors of the Evinrude company it was warmly welcomed.

Nor did it appear to the present writer that the out-and-out sailboats which were exhibited in large number belonged in the domain of the marine engine. In themselves they were fascinating, however, and perhaps as a first step in the training of motor boatmen they are almost indispensable. Certain it is that the small boy who plays around the water in a little sloop or cat picks up a knowledge of boat handling which will be useful to him all his days.

If the number of ship and boat models exhibited can be taken as a reliable indication, there is now a wide-spread interest in the construction and ownership of these miniature vessels. An association of manual training schools in New York City displayed a whole fleet of little racing sloops made by pupils in the schools and designed for sailing by young and old in lakes and ponds. In workmanship the models compared favorably with full-sized boats built by full-sized carpenters.

Objects in motion never fail to draw the attention of the crowds, and Boucher's models of various types of engines, operated by compressed air, had their full share of rapt admirers. The latest wrinkles in universal joints, in magnetos, and other marine accessories were also arranged in various booths for curious hands to twist and turn.

The newest thing in marine engine practice occupied the display booth of the Kraus Oil Engine Company. Here was seen a continuous combustion engine, which, although burning fuel oil under high pressure, has the major characteristics of a steam engine. Into separate air compressor cylinders working off the main crankshaft fuel is delivered and ignited. The cooling water, after it has passed through the water jackets and when it is practically at the boiling temperature is admitted in small quantities to the jet of burning gases, and in the form of steam enters the power cylinders and performs work upon the pistons. The expansive power of the steam is used in practically the same way as it is used in steam engines, and the highest pressure in the cylinders is constant during the period of the downward stroke. The result is a smooth and continuous power, with the exhaust at practically atmospheric pressure. The motor is started by hand or mechanical means and initial ignition is by a single spark plug and coil.

The most powerful, but by no means the largest motor in the show, was the new Allison twelve. This 500 h. p. engine adapted for use in fast cruisers and large runabouts is a V-model unit power plant with several noteworthy features. There are three spark plugs in each cylinder, insuring full combustion, two of which fire continuously, and each cylinder has two inlet and two exhaust valves. The motor is of the overhead valve type.

The large 150-h.p. Winton Diesel shown was of interest to all boatmen in the Hudson River Valley, because before long it will be one unit in the twin motor installation of a Poughkeepsie ferry boat. The ferry, used largely for cross-river automobile traffic, will be in almost continuous service, and the problem of the engineers was to obtain an easily controllable, flexible power installation. This was achieved in the twin Diesels operating 90 k.w. electric generators at 450 r.p.m., which in turn drive two 100 h.p. electric motors, directly coupled to the propeller shaft line. The propelling machinery will be so interconnected that either of the two motors or engines may be used as desired.

A striking contrast to the huge Winton and Nelseco Diesels was the little one-cylinder Kermath engine, shown for the first time. This diminutive power plant, which develops 3 to 4 h.p., is the smallest in the Kermath line, and it has the feature of parts interchangeable with the Kermath 16 h.p. An even smaller motor was the Johnson 35-pound outboard, a twin engine developing 2 h.p. It and other outboard motors gave visitors to the show an idea of the perfection which is attained in small as well as in large quantities in marine engine practice.

The new V-type Peerless model had its admirers. Made in eight and twelve cylinders, developing 250 and 400 h.p., respectively, this model has already found favor with the owners of fast boats. Motor boatmen of this fortunate class were also interested in the two new Sterling high-speed engines.

In various spaces on the main floor and mezzanine of the exhibition building were seen new models of Gary, Frisbie, Red Wing, Regal, Palmer, Doman, Isotta Fraschini, Fay & Bowen, Cleveland, Scripps, and other engines. When, on February 25th the horn sounded the close of the Show, it was the consensus that 1922 had shown more variety and progress in boats, engines, and equipment than any previous exhibition.

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The Function Switch

(*Continued from page* 20)

E is a fibre wheel held in a yoke pivoted at G, forced against the shaft by the spring I and having the contact U ready to close the circuit with its mate T. U and T are connected in series with the battery distributor ignition system. The wheel F is similarly arranged except that the magneto primary is connected at MP and the spring contact S is grounded.

Now when the deck control is thrown to the *Start* position the shaft runs through its whole travel until K is at position No. 4; E has dropped into the depression C, the battery ignition is turned on; the magneto is inoperative as it continues grounded at MP and the starting motor current surges across from N to N through the bar K; your motor turns over and comes to life. The operator moves his lever to *Slow*, which brings the switch to position No. 3 where the starting motor current is no longer on but U and T are still in contact and the motor runs on battery ignition with the advance determined by the automatic device in the distributor. The next move to position No. 2 is called *Cruise*. Battery ignition continues but roller F drops into the depression D, opens the magneto ground and the high tension magneto starts doing business.

Instead of running the magneto spark advance to the deck it is led to a clamp within a few inches of the magneto itself. When the boat is first put in commission and the throttle opened to cruising or standard speed, the magneto advance is moved about until a point is reached of greatest speed with no knock, when it is permanently locked in that position.

In the case of the original function switch that was built for Kex, the switch coil was bolted to the crank case near the magneto and the spark advance was attached to the handle of the magneto switch in such a manner that when the switch was on Magneto, the advance was correct for standard speed. In case the whole works went wrong and it became necessary to resort to hand cranking, the very act of turning the switch to Battery would retard the spark. In the case of engines not equipped with two systems of ignition, the end of the shaft V may readily be connected with the spark advance to retard the spark for starting.

I once had a friend who had a friend who offered to turn over his engine one morning—one of those long-legged he-motors of the old days. Had a starting bar about three feet long. Toilet room alongside engine room. Motor back-kicked. Bar went through the wall. Busted a well known article of porcelain all to H—smash. Hence the function switch.

In Search of the Treasures of Treasure Island

(*Continued from page* 70)

Robert Lamastus was a civil engineer of Lexington, Ky., before the spell of the tropics gripped him and he turned away forever from the lands where the snow flies. At Coiba Island he is king, and under the shade of the palms and the cocoanut trees he is happy. Viewed from the sea as we came to anchor off the spotless, white buildings flanked by terraces and flower gardens, we imagined it to be the seat of some wealthy island planter. But studying through the glasses the native canoe that was rapidly nearing our ship, we saw that all the occupants but one were in prison stripes and the exception was a big man with a big Colt automatic strapped to his side, from which facts we put two and two together and got four.

On learning the cause of our visit he offered us the hospitality of his island and assured us that several ship carpenters among his detained guests would attend to splicing the broken boom without further care on our part. So, while the boom was being spliced ashore, we turned our attention to the sails and after a week's steady work we were ready to put to sea once more, but minus the two latest additions who had boarded us at the Canal. They decided that a sailor's life was not true to fictional description and while they may not have had cold feet, still it was astonishing how important their business back in the States became as soon as they found that they could get to Balboa from Coiba Island.

So, with a deckload of coconuts and bananas, the gifts of our cordial American host, the original six set sail again and for ten days discovered innumerable Cocos Islands as they were regularly pointed out to us by our captain, but which, just as regularly, turned out to be fog banks. After chasing clouds and rainbows all over the bosom of the Pacific in this fashion, we were knocked breathless one afternoon when a sure enough unmistakable island broke through the clouds on the horizon and we never took our eyes from that bit of land till the gathering dusk hid it from our sight. But then we were not far away and at three in the morning we dropped our mud hook in Chatham Bay, Cocos Island.

(*To be continued*)

Advertising Index will be found on page 126

If you want to cook on board— and enjoy it, install

AUTO GALLEY KOOK KIT

SPECIFICATIONS

Body size, 20¼" x 10½" x 5¾". Legs 2" high. Body heavy galvanized iron strongly riveted. All fittings galvanized or of copper or brass. Gasoline tank separate from stove with 15 feet of copper tubing so it can be mounted on deck if desired. Tank made of galvanized iron, riveted and soldered inside; capacity 3 gallons. Pump is polished brass, 1¼" x 20". Full sheet of galvanized iron, slotted to fit legs, with each stove, to be used as covering for bench or table on which stove is mounted. Price complete with all equipment $35.00

Can also be had with one gallon tank and smaller pump, all other equipment the same. Price.....$27.50

For smaller boats, made with two-quart tank attached to end of stove, all other equipment the same. Price $20.00

If black or brown baked enamel finish is wanted, add 50c to price of any model.

Special stoves made to order with any number of burners. Send a blue print of your galley and we will gladly send an estimate.

Practical and efficient — requires minimum space — and is perfectly safe and easy to operate.

Auto-Galley-Kook-Kit was built at the request of several prominent boat owners and builders and designed in accordance with their ideas. The result is a practical galley stove, perfect in every detail, and adapted to both fresh and salt water craft.

Burns ordinary motor gasoline—gives a steady hot blue flame that a thirty mile wind will not blow out.

PRENTISS-WABERS STOVE CO.

General Offices and Factory,
108 Spring St., Wisconsin Rapids, Wisconsin.

Export Department,
1416 Broadway, New York City, U. S. A.

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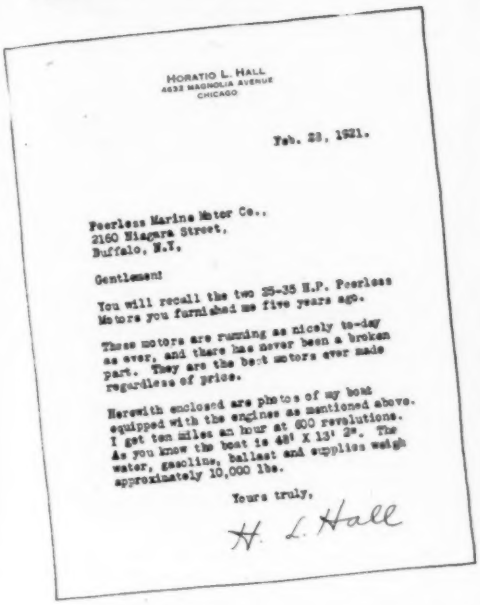
Peerless

"The Engine that Makes Good"



HORATIO L. HALL
4632 MAGNOLIA AVENUE
CHICAGO

Feb. 28, 1921.

Peerless Marine Motor Co.,
2160 Niagara Street,
Buffalo, N.Y.

Gentlemen:

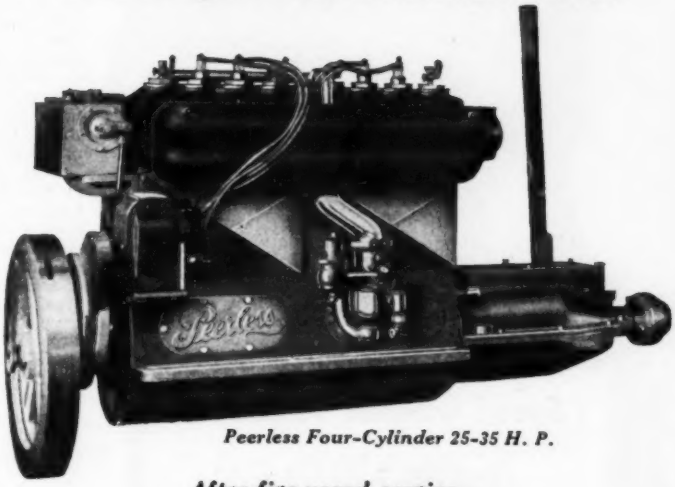
You will recall the two 25-35 H.P. Peerless Motors you furnished me five years ago.

These motors are running as nicely to-day as ever, and there has never been a broken part. They are the best motors ever made regardless of price.

Herewith enclosed are photos of my boat equipped with the engines as mentioned above. I get ten miles an hour at 600 revolutions. As you know the boat is 48' X 13' 2". The water, gasoline, ballast and supplies weigh approximately 10,000 lbs.

Yours truly,

H. L. Hall



Peerless Four-Cylinder 25-35 H. P.

After five years' service—
"They are the best motors ever made, regardless of price"

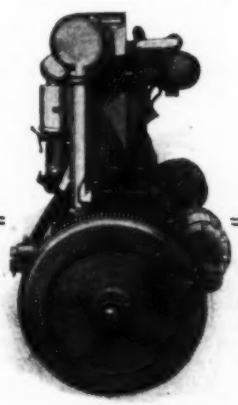
BRAND new owners are apt to be a bit enthusiastic about their motors and their boats. But when a man has shipped with the same motors five years, his opinion is a product of actual experience, a statement worth its face value. It takes a mighty good engine to please a man day after day for five years.

Peerless Marine Motors have a habit of making good and pleasing their owners. Not only that but they give the kind of service that makes boating a real pleasure or a profitable occupation, according to the type of boat you own.

These motors have proved it isn't necessary to pay a fancy price to get a satisfactory power plant. You may pay more or pay less, but you can't get greater value for your money.

The regular Peerless line includes motors from 5 to 50 H. P. built for medium and heavy duty, and suited to all types of boats. You will find them in classy speed runabouts, in big attractive cruisers and hard working fish boats.

Let us tell you the size, power, dimensions and price of the Peerless that is most suitable for your boat. If you are buying an engine this year you owe it to yourself to consider a Peerless.



Write today for latest catalog, giving dimensions and details of your boat.

Peerless Marine Motor Corporation

2160 Niagara Street **Buffalo, N. Y.**

The New High Speed Light Weight Peerless Motors

A year ago we added this high speed line, and it found instant favor with owners of fast boats. The lightest weight marine motors on the market, good for speeds of 25 to 45 miles per hour. Special castings and alloy steels give great strength with minimum weight. Speed 1650 R. P. M.

4 cyl. 125 H.P. Weight complete 700 lbs.
8 cyl. 250 H.P. V type. Weight complete 900 lbs.
12 cyl. 400 H.P. V type. Weight complete 1100 lbs.

Write for complete specifications and prices.

Finding One's Way at Sea

(*Continued from page* 33)

First note that the quantity C-W (chronometer minus watch) is omitted for the sake of simplicity. CT (chronometer time) is obtained by starting a stopwatch at the moment of taking a sight and stopping it on an even minute of the chronometer, adding the elapsed seconds to chronometer time at the moment of stopping the watch. If a stopwatch is not available it is almost as easy to set a hack watch exactly to chronometer time and have the helmsman record the instant of taking the sight.

CC is the chronometer correction, and is added to the chronometer time when the instrument is slow. The error of the chronometer—and there always is one—is obtained through the owner's knowledge of its daily gaining or losing rate, and by multiplying that rate by the number of days which have elapsed since a comparison with standard time was obtained.

Since my chronometer was set to Greenwich time and not to Washington time (which is five hours later) the application of CC to CT gives Greenwich Mean Time, or GMT. Eq.t., or the equation of time, is the difference between clock, or mean time and sun, or apparent time. Without going here into the necessity for its use, Eq.t. is found in the American Nautical Almanac for the year 1921, under date of August 11, between the hours of 8 and 10. The factor HD (hourly difference), 0.4, which occurs at the end of the table for the day, is used for interpolation. In this instance Eq.t. is a minus quantity, and it is subtracted from GMT to obtain GAT, or apparent time on the meridian of Greenwich.

Now we have found the sun time at Greenwich at the minute of taking the sight, and it becomes necessary to ascertain the local sun time in order to continue. It is found by applying the dead reckoning longitude of the boat (which, being west of Greenwich is subtractive) to GAT. No lengthy process is essential to the determining of the dead reckoning position. It is assumed by stepping off on the chart with the dividers the approximate distance covered on the approximate courses run since the last fix. If one feels lazy enough he can merely stick a pin in the chart at random and use that as DR. This is possible with the St. Hilaire method, but is not with the time sight.

In the present instance the longitude is 77° 52′. Table 7 of Bowditch converts arc into time and vice versa, and it is simpler and more accurate to turn to this table to find the time equivalent of an angle than it is to work the conversion out on paper. The equivalent of 77° 52′, which is 5h 11m 28s, is subtracted from GAT to obtain LAT, or sun time on board ship.

This is 4h 15m 42.6s, for it is afternoon, and the astronomical day commences at noon. Being afternoon, the quantity LAT is identical with t, the hour angle, or the period of time which has elapsed since the sun crossed meridian. If it were morning LAT would be subtracted from 24h 00m 00s to obtain t.

(In this connection it is well to note in Table 45 of Bowditch that when t is less than 2h 27m 29s the index figure of the log haversine (the figure to the left of the decimal) is 8 instead of 9, and that failure to note this change in the index is the easiest way to make an error of a hundred miles or so in working a sight.)

The hour angle is looked up on page 862, Table 45 of Bowditch, and the number appearing in the column of log haversines is set down. Beneath it is placed the log cosine of the dead reckoning latitude (13° 19′), which is found in Table 44 on page 785; and beneath that the log cosine of the sun's declination (15° 14′ 49″) found also in Table 44 on page 787. The three logs are added together to obtain the log haversine of what is called the auxiliary angle theta (Θ)—in this instance 9.42014.

Let us leave theta in midair while disclosing the mystery of d, the declination of the sun. Declination is, roughly speaking, the earthly latitude of heavenly bodies. On August 11, as is found by looking on page 20 of the Almanac and interpolating for the GMT of 9h 32m 14s between the hours 8 and 10, the apparent position of the sun north of the earth's equator is 15° 14′ 49″. If the navigator happens to be in latitude 15° 19′ 49″ N, the sun would be directly over his head at noon. In the case under consideration there is a difference of 1° 55′ 49″ between the boat's latitude and the sun's declination, and this difference is recorded opposite the heading L—d or Latitude, plus or minus declination. (When both observer and the sun are north of the equator the lesser angle is always subtracted from the greater.)

Returning to the auxiliary angle theta we look again in Table 45, this time on page 860, and find that in addition to the column of log haversines there is a column of natural haversines. The natural haversine of the log 9.42014 is .26313, which we set down beneath it. We also require the natural haversine of L—d, and we find on page 817 that it is .00028. The two natural haversines when added together give the natural haversine .26341, and we turn back to page 860 to learn that this figure occurs in coincidence with the boldfaced figures of the angle 61° 45′ 32″—

(*Continued on page* 94)

THE BACKBONE of THE STEARNS MOTOR

THE HEAVY CRANKSHAFT IN THE STEARNS—the backbone of the motor—is a chrome nickel steel forging carefully heat treated to insure uniform hardness throughout. It is unusually large for a motor of its size. As installed it weighs 165 lbs.

FREEDOM FROM BEARING TROUBLE IS ASSURED—frequent adjustment of bearings is eliminated in the Stearns. The exceedingly large bearings insure long life in even the most continually severe service. We believe the largest bearing areas ever incorporated in motors of similar horse power rating are found in all Stearns motors. The main bearings in the M.D. motor are 2⅞" x 4½"—the crankpin bearings 2¾" x 3¾".

PERFECT BALANCE IS OBTAINED—periodic vibration is absolutely eliminated in this crankshaft. No guessing—no experimenting is tolerated. Every shaft is put in perfect static and dynamic balance on Norton Balancing machines. This contributes to the smooth, vibrationless operation of Stearns motors and their velvet-like acceleration under even the heaviest loads.

You want power—dependability—all around satisfaction in a marine motor!—everyone does. Complete details regarding Stearns motors will exceed your expectations—you will become enthusiastic when you obtain our PRICES—THE LOWEST EVER QUOTED for engines of similar character. Inquire today.

Stearns Motors are made in 4 sizes.: 20 H.P. to 100 H.P., 400 to 1600 R.P.M. Full force feed lubricating system. Bosch starting, lighting and ignition system. Stromberg carburetor. Snow and Petrelli reverse gear

THE STEARNS EXTRA RESERVE MOTOR

Bowler, Holmes & Hecker Co., 259 Greenwich St., N. Y. Central Marine Service Corp., 709 Vinton Bldg., Detroit, Mich.

STEARNS MOTOR MFG. CO. **LUDINGTON, MICH.**

Finding One's Way at Sea

(*Continued from page 92*)

which without question we accept as Z., or zenith distance, of the difference between the altitude of the sun and 90°. To obtain our calculated altitude, therefore—and this has been the intention of our computations—we subtract 61° 45′ 32″ from 90°, and obtain 28° 14′ 28″.

So far in working the sight we have been dealing in theory. We have assumed that at the instant of taking a sight of the sun we were in a certain place on the earth's surface, which we set down as our DR position, and it has been our purpose to determine what the altitude of the sun would be if we were actually there.

But the altitude which we obtained on the sextant when taking the sight was not 28° 14′ 28″, but 28° 04′ 00″. This angle was subject to a minus correction of 1′ for sextant index error, and a further combined correction of plus 11′ 22″, which we find in Table 46, opposite 8 feet, which is the height of the eye above the sea. The corrected altitude, or h, is, therefore, 28° 14′ 22″.

As it happens the difference between the calculated altitude and the observed altitude is too small to bother with. But this difference, which is called the intercept, is applied *away* from the sun because the observed altitude is less than the calculated altitude. The sun's azimuth at the time of taking the sight is found in the book H.O. 71, Azimuths of the Sun, to be 281°. This is another way of saying that 281° is found to be the true bearing of the sun from the ship at the instant of taking the sight.

In normal procedure the navigator turns to the chart at this juncture and draws on it the azimuth or true bearing of the sun from the ship, placing a dot on the line to indicate the amount of intercept away from or toward the sun. At the dot a perpendicular to the azimuth is drawn—it is called a Sumner line—and the navigator knows that his ship is positioned somewhere along that line. Her exact position cannot be found until another sight is taken, another Sumner drawn, and their intersection found.

Under the circumstances governing the taking of this sight, however, I was satisfied that I knew the position of Hippocampus with sufficient accuracy. My sight taken for latitude at noon, four hours earlier, had been good, and we had sailed a steady course at a steady rate of speed. The small intercept of 6″ corroborated the exactness of my DR position, and I was content to put away my instruments and not trouble myself with navigation until the following morning.

If, however, as sometimes happens, an intercept of less than a mile is obtained in a morning sight, I am disposed to distrust the accuracy of the sight. I cannot believe that after sailing twelve or fourteen hours in a small boat I can gauge my dead reckoning position within one mile, drift and leeway being the inconstant factors that they are. Whenever such close results are obtained from my morning sight I immediately take another sight. If that corresponds with the first, the accuracy of both is accepted.

To be the competent navigator of a small motor or sailing boat a man has to acquire a rather peculiar attitude of mind. Being constantly on the alert to avoid mistakes, he must be unusually vigilant, and distrustful, when his sights put him exactly where he thinks he is. On the other hand, when he has put away his instruments upon concluding his calculations he must have absolute confidence in the accuracy of his determined position. This confidence comes with experience.

When I have worked two Sumner lines and found their intersection I am usually as positive that my boat is at the point of intersection as I am that I am on the boat. If, because of sea or atmospheric conditions, I am not positive of the correctness of my work, I do not rest easily until other sights make me sure.

On the cruise of Hippocampus my navigational routine was simple. While we cruised along the America coast I took only an occasional sight for practice; and when we reached the Caribbean and learned that our latitude nearly corresponded with the sun's declination I let myself be governed by the circumstances. That is to say, the sun's azimuth altered so little from morning to night that it was impossible to obtain a satisfactory cross from two St. Hilaire sights, and so I contented myself with one sight in the morning and one in the afternoon. The morning sight, taken between seven-thirty and nine, was good for longitude, and was carried forward and crossed with the noon latitude sight, giving me my fix. And in the afternoon, the latitude line was brought forward to cross with the four o'clock Sumner line, corroborating the noon fix.

I made it a rule to take three observations at intervals of a minute or so, being assisted by the helmsman who noted the times as I called "Mark" and who wrote down on paper the sextant angles as they were read to him. I did not average these times and angles, as is sometimes done, but selected the observation of the three that seemed most logical and worked it out.

(*Continued on page 96*)

Advertising Index will be found on page 126

Tear off the Bottom of this Page

STANDARD

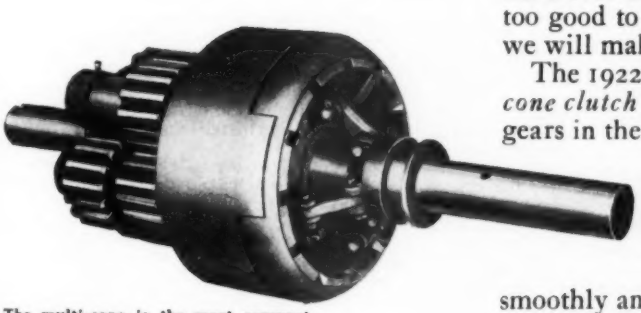
"All the Name Implies"

DON'T go through another season with your troublesome or inefficient old clutch and reverse gear. We offer you a better clutch and gear than you have ever used before, and if you think your old gear is too good to throw away, let us tell you what allowance we will make you on it.

The 1922 Standard Reverse Gear with the *new multi-cone clutch* is easily the biggest improvement in reverse gears in the past ten years. It is a gear that will outlast your engine and give you the same excellent service from first to last.

The multi-cone clutch has tremendous holding power on account of its large friction area. Furthermore, it takes hold smoothly and disengages so completely there is no drag in the neutral position.

The gearing gives full speed on the reverse. The gear mechanism is accurately made of the finest steels and is several times as strong as necessary to carry the rated power load.



The multi-cone is the most compact clutch possible to design. The friction surfaces are at the most effective point—the point of largest diameter while the toggle mechanism is inside of the cone

These big cones cannot buckle, warp, stretch or drag as discs do when great pressure is applied. The longer they are used the better they work because the cones simply lap into one another more perfectly

Write us today for prices on the proper size gear for your engine. Fill in the coupon below.

Standard Gear Co.
5928 Commonwealth Avenue
Detroit, Michigan

Fill this in and mail to us for our exchange proposition

Here are the details of my boat, engine and reverse gear. Please quote price on a new gear.

Length ..... Beam ..... Type .....
Engine ..... Model .....
H. P. ..... R. P. M. .....
No. Cylinders ..... Bore ..... Stroke .....
Dia. Crankshaft .....Dia. Propeller Shaft.....
Present Reverse Gear..... Model..... Year.....
Name .....
Address .....

Finding One's Way at Sea

(*Continued from page 94*)

For verification I often worked the other two observations independently, and if the three sights did not jibe within a mile or two, discarded them all and took a new set.

When navigating in northern latitudes a more comprehensive day's work is advisable. I would recommend that the navigator rouse himself from his slumbers and take a sight of the sun while it is still north of the prime vertical—i.e., while it bears north of east. This sight would be taken solely for the purpose of checking dead reckoning longitude. Assuming a new DR position from this sight, I would stand by and snap the sun again when it was exactly on the prime vertical, and be satisfied that I knew my longitude almost to the second, because when the sun bears east or west the Sumner line runs north and south. Midway between this sight and the noon sight, say at 9:45, I would work another St. Hilaire sight, run my Sumner line, and bring my early longitude forward to cross with it. This would give me an accurate morning fix. The noon latitude would follow in due time, and in the afternoon I would duplicate the morning's programme of crossing the Sumner lines of two sights.

The ship's position might render advisable the taking of star sights, but I would be disposed to accept their findings as approximate. Cruising on the Atlantic coast of America one should be particularly careful of his morning work, having in mind the fact that in the afternoon the sun bears over the land, and that unusual refraction may spoil the accuracy of the work. This distortion is liable to occur at distances up to twenty miles from shore, even though the horizon is clear in the direction of the sun and there is no land visible.

My whole scheme of navigation on a small boat tends toward simplification and the elimination of the possibility of error. All dead reckoning is done on the chart itself and it is years since I have looked, doubtfully, at a traverse table. I employ a course protractor instead of parallel rules because the protractor eliminates the chance of applying variation and deviation the wrong way. I trail a patent log because it is amusing and sometimes helpful, but I am always ready to believe that it lies. In an envelope pasted to the cover of my navigation notebook I keep samples of different forms that I have worked in times past. More than once I have found it convenient to refer to these when I have forgotten the value or purpose of some quantity in a formula.

I confine my celestial observations almost entirely to sights of the sun, and place little reliance in results obtained from altitudes of less than twenty degrees. I leave the moon and planets severely alone, and when I find latitude from the Pole Star I consider my finding as only approximate. I am rather fond of experimenting with such friendly stars as Vega and Antares, but I have learned through many failures that a small boat is too unstable for reliable work with the stars. Moreover, the navigator of a motor boat finds that what with cooking meals, standing regular night watches, and doing the day's work, he has little unbounded enthusiasm for star gazing.

Despite my previous assertion—and my honest belief—that celestial navigation is simple, the navigator of a small boat has many annoyances that are unknown to the navigator of a ship having a well-appointed chart house at his disposal and a steady platform on which to work. But it is these very complications which make the practice of the art so intensely interesting to the motor boatman. They supply the quality of opposition which enhances the fascination of any pursuit, and they render more satisfying the attainment of trustworthy results. Moreover, they put a premium on skillful, conscientious work.

Even if navigation were an inherently difficult science, no motor boatman who cares for sea cruising could afford to be deficient in knowledge of it. So long as a man does not know how to find his way about in the open sea he is firmly tethered to the shore. He may take long cruises, but they must be coastwise. He will not dare run to Bermuda, say, and if he is blown out of sight of land he must expend time and nervous energy beating blindly back to the familiar element.

On the other hand, the navigator may never have occasion to glance through Bowditch or to take his sextant from the rack. But he has the mental equipment needed to save the lives or at least minimize the anxiety of his cruising mates, and the self-confidence which accompanies his knowledge of navigation more than doubles his enjoyment of the sport of motor boating.

The Universal Four-Cylinder Motor

The Universal four-cylinder, 9-12 h.p. marine engine may be used in about 80% of all types and sizes of motorboats—from the small high speed runabout to the larger family launch—and for dories, fishing boats, work boats, etc.

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Some Questions on Small Boat Handling

(*Continued from page 42*)

34. If you should desire to come to anchor in a southerly wind which way should your boat be heading before throwing over your anchor (assuming no current)?
35. If your anchor became made fast in rocks or other obstruction on the bottom so that you could not readily haul it on board what action would you take?
36. If you ran aground what means would you take to get off bottom?
37. Referring to figure 230 (December MoToR BoatinG) where would you anchor in Oyster Bay in a north-east gale?
38. Referring to figure 230 (December MoToR BoatinG) assuming your boat to have a speed of ten miles an hour, you were suddenly caught in the fog. You got out your lead and line and took soundings with the following results.

    10:00 A.M. Course W x N 20 feet
    10:06 A.M. Course W x N 147 feet
    10:12 A.M. Course W x N 163 feet
    10:18 A.M. Course W x N 180 feet
    At 10:18 A.M. the course is changed to S x W
    10:24 A.M. Course S x W 21 feet
    10:30 A.M. Course S x W 21 feet

    How many miles off Eaton's Neck Light and what direction will the light bear from your location at 10:30 A. M.?
39. With a tide having an average range of 12 feet and the chart showing a depth of 6 fathoms at mean low water which on the particular day in question occurs at noon, how deep would you expect the water to be at 1 P. M.?
40. What equipment in addition to that required by law do you think is essential to be carried aboard the average motor boat?
41 to 50. As the conclusion questions to the Correspondence Course we suggest that you write a few words in giving your opinion of the Correspondence Course, how it may have helped you, and give any suggestions which you care to write about how the course could be improved or made of greater benefit to motor boatman.

The following, whose papers were received during January, have passed:

LESSON No. 1

H. C. Burr, A. E. Burgess, Harold P. Cahill, F. G. Moe, W. A. Royce, Charles Ruder, C. V. Spriggs, H. S. Stone, Geo. P. Webster.

LESSON No. 2

H. C. Burr, Charles A. Baker, William Baumgart, A. E. Burgess, H. J. Hodgdon, Paul A. Isherwood, F. G. Moe, W. A. Royce, Charles Ruder, C. V. Spriggs, John P. Turcotte, H. Lloyd Williams, Geo. P. Webster.

LESSON No. 3

B. P. Boell, H. C. Burr, William Baumgart, A. E. Burgess, Crawford Hoke, Paul A. Isherwood, F. G. Moe, W. J. Mozart, W. A. Royce, C. V. Spriggs, Geo. P. Webster.

LESSON No. 4

B. P. Boell, H. C. Burr, Milton C. Bergey, Lester L. Harrington, Walter W. Monroe, W. J. Mozart, Alexis M. Russell, W. A. Royce, Geo. P. Webster.

LESSON No. 5

W. S. Betts, H. C. Burr, Kenneth Gess, Lester L. Harrington, W. J. Mozart, Louis W. Preiss, Kurt Roenitz, Alf. A. Thomas, D. E. Trefry.

LESSON No. 6 AND 7

A. E. Jones, L. F. Merritt, W. J. Mozart, Kurt Roenitz, J. K. Sexson, H. H. Sellew, Alf. A. Thomas.

LESSON No. 8

Warner A. Bates, W. S. Betts, A. E. Jones, L. F. Merritt, W. J. Mozart, Louis W. Preiss, Kurt Roenitz, J. R. Sexson, Alf. A. Thomas.

LESSON No. 9

H. R. Broll, W. S. Betts, A. R. Burr, L. L. Crosthwaite, Leslie F. Chapman, R. Finigan, W. J. Gorton, Kenneth Gess, H. J. Hodgdon, A. E. Jones, C. M. Labunski, L. F. Merritt, W. J. Mozart, Edward F. Mathews, Louis W. Preiss, Geo. A. Ramson, Joseph Reinhardt, Kurt Roenitz, J. K. Sexson, Fred Scadden, Alf. A. Thomas.

LESSON No. 10

Henrick Boche, A. R. Burr, J. Calvert, W. A. Cornell, L. L. Crosthwaite, Clarence W. Culver, Leslie H. Chapman, J. Dunbaugh, Arthur Ek, Albert J. Fenton, H. Greinert, Kenneth Gess, H. J. Hodgdon, A. E. Jones, C. M. Labunski, J. W. Lough, J. F. Lowcock, L. F. Merritt, W. B. Moores, W. J. Mozart, Don C. McLean, Frank Mitchell, Edward F. Mathews, Mason S. Noyes, Edward J. O'Beirne, Louis W. Preiss, Edmund Roxby, F. B. Smith, H. R. Stiles, Fred Scadden, Alf. A. Thomas, M. A. Young.

LESSON No. 11

R. Andren, Dr. A. B. Bennett, Joseph Bister, W. G. Boyden, Charles E. Burch, J. Calvert, Michael Gibener, W. A. Cornell, Leslie H. Chapman, Arthur Ek, J. S. Ellsworth, Vincent Francis, Willard M. Foster, Charles E. Grush, W. C. Gustafson, Edward J. Jones, Mrs. E. G. Kaiser, W. B. Landreth, W. J. Mozart, P. F. McMahon, Edward F. Mathews, L. McKenzie, Mason S. Noyes, Ed. J. O'Beirne, John Rerchester, Edmund Roxby, Dr. J. F. Schefcik, F. B. Smith, Morton B. Steele, Alf. A. Thomas, D. E. Trefry, Dr H. E. Watkins, William O. Yates, C. S. Young, E. T. Youngfelt, H. T. Zachgo.

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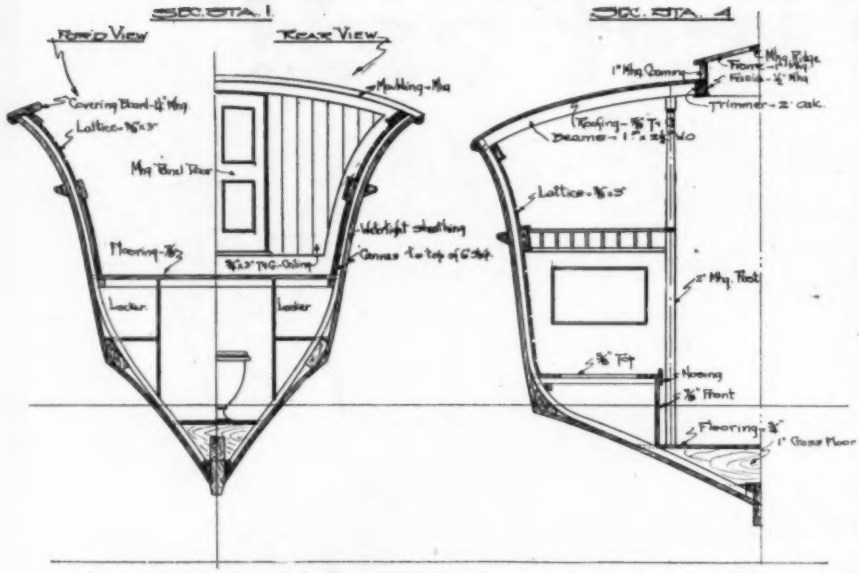
Advertising Index will be found on page 126

Margie, a 31-Foot Hacker Cruiser

(*Continued from page 29*)



Construction sections at Stations 1 and 4 in the forward portions of the hull

The latter will allow a good strong job and more simple.

Engine Bed: To have a 2-inch engine stringer to extend from forward end of motor through to stern, to be bolted to floor with ⅜-inch bolts in vicinity of motor, and drift bolted with 5/16-inch stock aft. To be spaced so that motor will fit in between. Engine bed to be of white oak of 2½-inch stock, to be drift bolted to floor and through bolted to stringer with ⅜-inch bolts. To be aligned to suit motor to be installed.

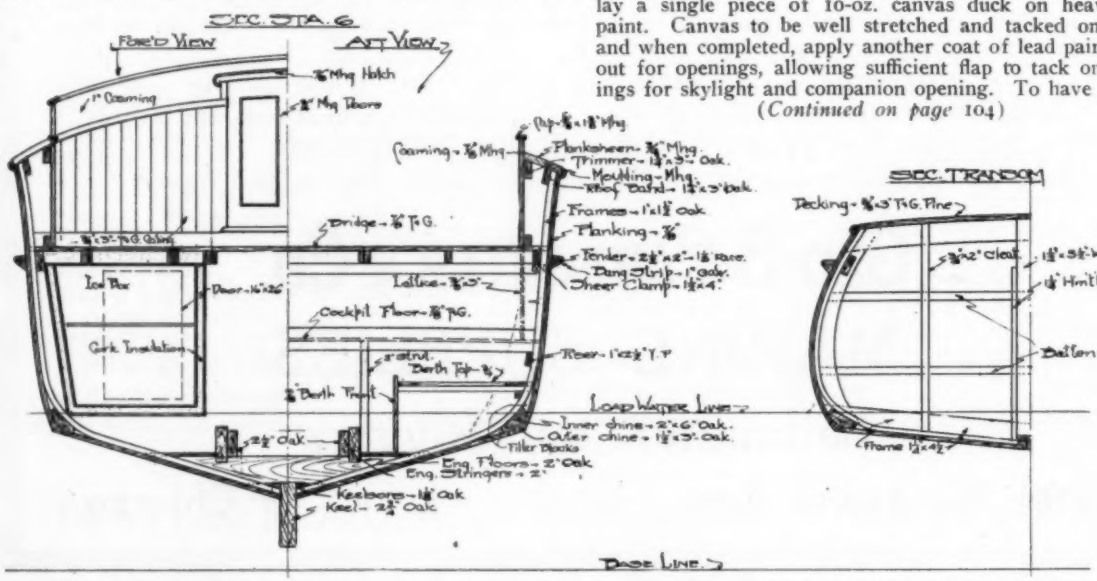
Deck Beams: Beams in forward cockpit and aft cockpit to be of 1- by 3-inch white oak or yellow pine, to be set on and fastened to a 1- by 2½-inch riser with screws. Hatch trimmer in aft cockpit to be of 1- by 3-inch oak. Frame of 1- by 2½-inch and beams of ¾- by 2½-inch oak. Cabin beams to be of 1- by 2½-inch white oak. To be finished with lower edges chamfered. To be sawed to proper radius and screw fastened into top clamp. Aft deck beams to be of 1- by 2½-inch white oak and fastened in a like manner.

Frame-in-General: Entire frame to be neatly trimmed and faired to receive the planking. All surfaces to be painted with lead paint before making final fastening in any part of frame. Also all frames, etc., shall be painted as the planking is applied. All bolts shall be galvanized unless otherwise specified, and where exposed, shall be painted with red lead and holes plugged with wood plugs.

Planking: To be preferably of ⅞-inch white cedar. Port-Orford cedar, white pine or cypress may be substituted if white cedar is not available. To be spiled to approximately 5-inch widths. All planking to be in as long lengths as practical, and butts to be made on oak butt blocks to fit in between frames. Planking to be fastened to bent frames with 2½-inch copper wire nails, riveted over burrs. To be counterbored and holes wood plugged. To be screw fastened into stem, stern, chines, and keel with 1½-inch No. 10 brass screws below water line, and galvanized above. Butt to have six copper rivets on each half. Entire hull to be thoroughly dressed and sanded, and all seams to be caulked with spun cotton and then to have coat of hot oil throughout. Use 2/3 linseed oil and 1/3 turpentine, apply boiling hot. If sawn frames are used, planking to be ¾ inch on sides and ⅞ inch on bottom. To be screw fastened throughout. Using brass screws on bottom and galvanized on sides. Use 1½-inch into frames on sides and 1¾-inch on bottom, 1¼-inch into stringer. Butt blocks to be well painted with pure lead paint, as well as all butt edges of planking. Plugs to be payed in white lead. All holes to be counterbored with a Forstner plug bit and plugged with plugs made from same material.

Decking: Forward cockpit to be decked over with ¾-inch pine or cedar. To fit a coaming all around. Decking to be thoroughly dressed and apply coat of lead paint. Then lay canvas duck in heavy paint, tacking to decking and side coamings. Then to have filler up to clamp to make water tight. To have a 1¼-inch lead pipe scupper on each side with outlet just above water line. Cabin roof to be of ⅝- by 2½-inch white pine ceiling, with a ⅛-inch V edge on bottom side. To be galvanized nail fastened to beams. Cut openings for skylight and companion. Dress and sand thoroughly and apply coat of lead paint. Then lay a single piece of 10-oz. canvas duck on heavy lead paint. Canvas to be well stretched and tacked on edges, and when completed, apply another coat of lead paint. Cut out for openings, allowing sufficient flap to tack on coamings for skylight and companion opening. To have ½-inch

(*Continued on page 104*)



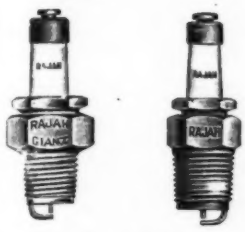
Midship construction section which gives sizes for all structural members drawn at Station 6 and a section of hull at transom

To Save Time and Trouble, Standardize on

RAJAH *SPARK PLUGS*

Waterproof Rajah Plug
Waterproof
Shockproof
Breakproof

Made especially for all exposed and outboard marine motors. $1.25 all threads.



Giant Rajah Plug $1.25 all threads

Standard Rajah Plug. $1.25 all threads.

You must be satisfied with indifferent spark plug service if you are indifferent about the make of spark plugs you use.

There are so many different plugs on the market, all about alike in appearance, that you can never hope to know the comparative efficiency of all the various makes. The only sensible method is to stick to one plug of known quality—a tried and proven plug like Rajah.

For more than 20 years Rajah Plugs have ranked first among quality spark plugs. They are a favorite with motor boat racers, automobile racers, aviators and all others who seek utmost power and efficiency.

This year decide to abolish all spark plug trouble and annoyance. Standardize with Rajah Plugs and start the season with a full set.

If your dealer does not have genuine Rajah Plugs, we will see that you are supplied. Write today stating size wanted or name of your engine.

RAJAH SOLDERLESS TERMINALS

(Actual size)

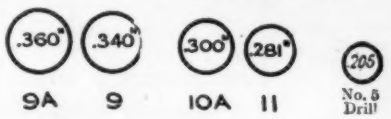
Thrust Clip **Hook Clip** **Ring Primary** **Assembly to Cable**

The biggest little thing you can do to your boat this spring is to equip all your spark plug wires with Rajah Solderless Terminals. You can do it in a few minutes, without solder or tools. It will cost you less than a dollar, and you'll never stop congratulating yourself on the investment.

To attach terminal to cable you simply strip insulation back 3/16", insert wire in ferrule and screw down the pointed part as shown. It can't shake loose or come apart but you can detach it instantly. Rajah Terminals fit on any spark plug.

If your dealer hasn't stocked this terminal yet, send us his name with 15 cents for a sample. Or order enough to equip all your spark plug wires, stating sizes and types wanted.

Option in following ferrule sizes



These are the celebrated standard Rajah Terminals

Thumb Nut — with all Rajah plugs unless Ball or Stud type preferred 10c each

Regular Fits any size cable 10c each

Thrust 10c each

Hook 10c each

Primary 7c each

Furnished with ferrules to fit any size cable

Keeps connections dry Protects against shocks Fits any plug or coil 15c each

Manufactured by Rajah Auto Supply Co., Bloomfield, N. J., U. S. A.

Margie, a 31-Foot Hacker Cruiser

(*Continued from page* 102)

coming finished on inside to which canvas shall be tacked after painting. To have a ¾-inch filler block for ventilator. Aft cockpit to be decked over with ⅞ by 2¼-inch white pine strips. To be galvanized, fastened to beams. To have coaming on each side to extend 2 inches above floor. Seams to be uniform and lightly caulked with spun cotton and seams filled with black marine glue and then to be dressed thoroughly for natural finish. Aft decking to be of ¾-inch pine or cedar to partner to be thoroughly dressed and painted then to have 10-oz. canvas duck laid on heavy paint same as cabin. To have a ¾-inch mahogany covering board from cabin to transom, to be screw fastened to trimmer, planking, and partner, with holes counterboard and plugged. To have a 1¾-inch lead scupper in cockpit leading overboard above water line, on forward and aft end of cockpit. To have a ⅞-inch mahogany covering board in forward cockpit, to be shaped as per plan, and inside to form nosing.

Bulkheads: Forward and aft bulkhead to be preferably of ⅞-inch panel. Otherwise of ¾ by 3-inch V-edged staving, fastened to framing forming inside panel and beams with galvanized screws. Allow opening for doors and to be fitted with proper door stops and sill as per plan. To provide either a single paneled door or double doors forward for access to forward cockpit. Double doors for companion of ⅞-inch mahogany. To have partition immediately aft to form toilet room. This is also to be of ¾-inch staving or panel and to have door stop and sill also a ⅞-inch paneled door for access to toilet room. To have another partition immediately aft, to form locker of ⅝-inch staving of same pattern with rabbeted corner to form stop for a ¾-inch door, to be either paneled or solid, with cleats on inside to keep shape. To have either copper wire screening as indicated on plan, or a number of holes to allow for ventilation. To have a partial partition having post to extend to ceiling, and rabbeted to receive ceiling up to clamp. To have a rabbeted cap on top with another cap fitted approximately 3 inches above, and to be fitted with ⅝-inch square mahogany posts to form pin-rail.

Fenders: To have a top fender of 1½-inch mahogany or oak to be securely screw fastened and holes wood plugged. Main fender to be shaped from 2 x 2½-inch oak and to have a face to take 1-inch galvanized half round iron or brass. To be securely screw fastened into clamp and taper slightly at both ends. The metal protection to be screw fastened every 6 inches. A 1½-inch half-round guard at the outermost point on the sides of hull above the water line is to extend aft to a point where it will intersect the top main fender. This is to be fastened in a like manner. The top fender is to be finished natural.

Cabin-Interior: Flooring to be of ⅞-inch white pine, center to be removable. Also side of motor. Flooring to be galvanized screw fastened and sections cleated. To have a raised platform to receive toilet, to be boxed in as indicated on plan. To have lockers on each side, or shelves as desired. To have a dresser on starboard side with a ¾-inch paneled front and to provide three drawers of raised panel type with mahogany fronts. Top to be of pine or white wood and to have rail and posts for form pin-rail of mahogany. To have locker on port side with door and shelves to conform with other side, to which will be fitted a wash bowl and pump to be connected outboard or to water tank. Toilet shall be properly mounted on platform and properly connected outboard with suitable sea cocks, piping, etc. To have a ⅞-inch panel seat on port and starboard sides as shown on plan. This can be of mahogany, finished natural, or of white wood enameled. Tops to be of pine, properly cleated with removable panels for access to storage space underneath. The top of panel is to be rounded off to form a nosing. Sides up to the clamp are to be finished with ⅜ by 3-inch lattice. Clamps to be boxed and to have a nosing on bottom of top clamp and on top of sheer clamp. There is to be galley on the port side arranged as per plan. The fronts of lockers to be of ¾-inch ceiling or panels. Provide a drawer and doors under for storage fitted with necessary shelving. The sink to be 12 by 12 inches and can either be of standard make or built in and copper lined. This is to be provided with proper drains outboard and a suitable galley pump which is to be properly connected outboard or to water tank. Ice box to be built under raised platform. To consist of two thicknesses of ½ by 3-inch staving with a 1-inch space between which is to be filled with granulated cork. The ice-box is to be lined with galvanized iron. It is to have a separate ice compartment with barred front and two shelves of the rack type of wood or metal. Access is to be had from inside the cabin with a door of the ice box type, metal lined with 1-inch cork filled space. It is to be finished to match the interior work and fitted with suitable hardware. A removable cover should be provided so that the box may be filled from outside the boat. A suitable drain outboard should be supplied.

(*Continued on page* 108)

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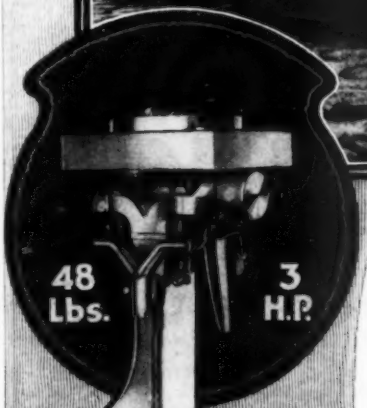
Lewis R. Freeman's 2700 Mile Trip with the Elto Light Twin



Mr. Freeman, shoving off at Sioux City, Ia.

Proof of its Rugged Construction and Long-Wearing Qualities

On Nov. 1, 1921, Lewis R. Freeman of Pasadena, Cal., well-known writer, completed a 2700 mile trip from the head waters of the Missouri, down the Mississippi to New Orleans, using an ordinary rowboat powered by an Elto Light Twin. On this trip he gathered material for his writings.

During the trip Mr. Freeman wrote us: "The Elto has been making a remarkable showing under especially trying conditions of weather and water. The Missouri is ***liquid mud*** for most of the year, with interminable sand bars. For this reason a motor hitting right off and pushing a boat at 10 miles per hour, most of the time, has attracted a lot of attention."

1500 Miles—"Performing Splendidly"

Reaching St. Louis after 1500 miles of running, Mr. Freeman wrote: "The motor has been performing splendidly. At the end of 1500 miles I have not used as much as a pin of the replacements I have on hand, save only the pump, worn somewhat by the sand, and a couple of rubber hoods for the spark plugs. As far as I can see, the motor is in excellent shape, but will have it taken down for inspection."

Wm. Grossman, 1630 Pine Street, St. Louis, Mo., who took down Mr. Freeman's motor, said: "After thoroughly going over his engine we found everything in perfect condition with the exception of the pump, which was worn by the sand. I have been repairing outboard motors for 7 years. I certainly was surprised to find the propeller shaft in such fine shape. I must congratulate you on the workmanship, especially on the gear housing—also the many other excellent features. Mr. Freeman's 1500 mile trip with your motor has proven to me that the motor is not only a first class one but has long wearing qualities.

Mr. Freeman continued to New Orleans and after his 2700 miles of strenuous going, returned the motor to us for inspection at our request. It was found to be in excellent mechanical condition and in spite of the extremely hard usage, showed no noticeable wear.

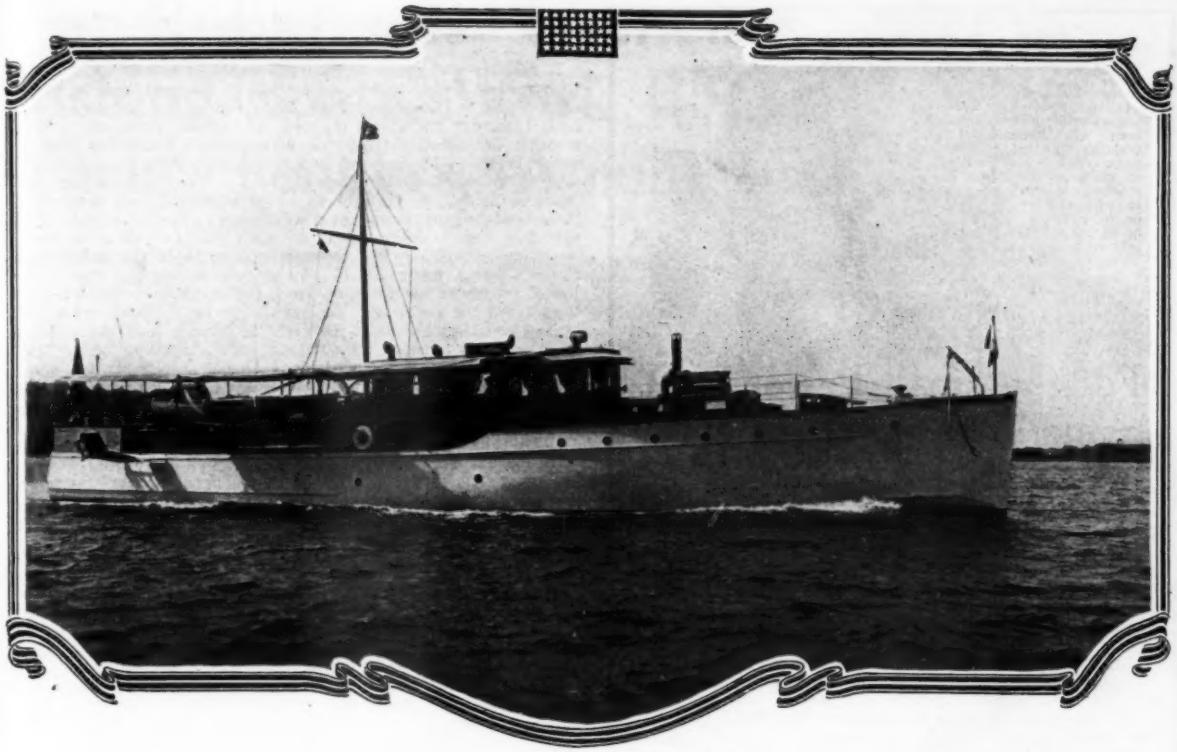
Write to Ole Evinrude's new organization for full information about the 19 big, new Elto features.

Elto Outboard Motor Co., OLE EVINRUDE, Pres. Dept. F, Mfrs. Home Bldg. Milwaukee, Wisconsin

Elto

Light Twin Outboard Motor

Advertising Index will be found on page 126



Topaz Is Now Winton Powered

"TOPAZ" the splendid 77-Foot Cruiser owned by Mr. J. Richmond Fales, Providence, R. I., and designed and built by Frederick S. Nock, is now powered with a pair of six cylinder, 140 H.P. 6½" x 9" Winton Gasoline Engines.

For cruisers of this type Winton Gasoline Engines make the ideal power plant and a majority of the finer type of such boats are equipt with these reliable, quiet, clean motors.

Quietness, cleanliness and dependability are essentials demanded by Owners, Architects and Builders—these three main requisites are inherently a part of every Winton Engine, whether it be Gasoline or Diesel.

Write for Complete Catalog, which will gladly be mailed promptly on request.

WINTON ENGINE WORKS, CLEVELAND, OHIO, U. S. A.

New York—A. G. Griese, Inc., 30 Church St. San Francisco—F. G. Bryant, 593 Market St.
Seattle—H. W. Starrett, Sunset Engine Co. Washington—R. L. Fryer, 817 Albee Bldg.
New Orleans, La.—A. Baldwin Company

Winton

Margie, a 31-Foot Hacker Cruiser

(*Continued from page* 104)

A suitable mahogany stairs made from ⅞-inch stock provided with rubber treads and brass nosing to be built approximately as per plan. These are to be made removable and fitted with hook fasteners and cleats on each side on the floor. A suitable wooden or metallic frame to form a seat back and also an upper berth to be supplied and fitted with a hook and eye as well as an eye on the forward side, to fasten to ceiling with chain or cable. A skylight to be of approved type made with ⅞-inch mahogany frame of Davis patent type or equal. Provide five 7-inch bronze ports on each side of the cabin to be spaced as per plan. The companion is to be of the sliding type runners being made of 1½ by 2-inch mahogany. tapered to 1 inch on top screw fastened from the inside and through fastened from the coaming. To have a ⅛ by 1¼-inch brass runner on top, and the sides of cover to have a half round brass tube, fastened to same with bottom edge extending under brass runner. All hinges throughout to be bronze butts of ample size. Doors are to be provided with suitable bronze knocks, bolts, etc. and drawers to have suitable pulls and ball type fasteners.

Cock-Pit: Coaming to be of ⅞-inch mahogany and capped with ⅝-inch, screw fastened and wood plugged. Seat back to be ⅞-inch and capped. Coaming on deck to be of 1-inch mahogany through fastened from inside and capped, allowing opening for hatch slide. To have a raised platform to extend from side to side to provide room for ice box, motor, and berth. This is to be fitted with a removable center cover and covered with ¾-inch T & G white pine, canvas cover. Cockpit flooring covered under decking. There is to be a removable panel of ⅞-inch stock. Sides are to be filled in up to the coaming. A suitable housing shall be constructed of ⅞-inch mahogany for the steering wheel which shall also carry a binnacle box for a 3-inch card W & C oil compass.

Painting and Finishing: Dressing of hull already specified under Planking. After the coat of oil has been applied fill seams with composition followed by a prime coat of lead paint on the outside. Apply one heavy coat of red lead on the inside up to the water line. Then two coats of the desired color on the inside of the hull. The outside to have three coats of paints above the water line, marine white or gray as selected. Two coats of anti-fouling paint below the water line. All canvas after treatment previously specified to have two coats of lead paint or enamel, color as selected. The forward side of cabin front and aft side of cabin end to finish natural mahogany. All trim as drawer fronts, clamp boxing, stairs, skylight frame, companion way, post, pin rails, also coaming in cockpit, seat nosing, seat, back, all doors, etc., to be properly filled with best paste filler and then to have three coats of best spar varnish. The balance of the interior except the flooring to have prime coat of pure lead paint slightly drab color followed by two coats of flat white and one coat of best white enamel. Flooring to have two coats of lead paint. All surfaces under seats etc. to have one coat of lead paint. Cockpit flooring to have three coats of spar varnish. Binnacle box to be finished natural in the same manner. Transom to be natural finished above water line. Ice box to be painted inside and out with one coat of lead paint. All work to be well sanded down in between coats with fine sand paper. Bottom paint to extend 9 inches above the water line at the stem and six inches at the stern. No surface whatever in the entire hull shall be without paint.

Hardware and Fittings

Interior Hardware: All hardware specified for the interior to be of solid bronze and the very best quality for the various purposes intended and shall be subject to the approval of the owner or his representative.

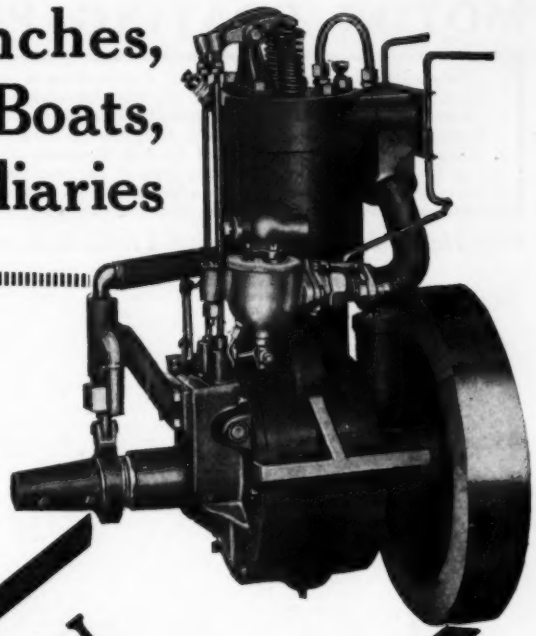
Deck Fittings: Bow chock, of Durkee pattern—Fig. 441 B. Cowl ventilator of standard 5-inch type. One 12-inch hollow cleat forward and two 9-inch on aft deck and one 7-inch on each side. All of bronze. Electric running light of Geo B. Carpenter type for class two. Aft flag pole and light of Wilcox-Crittenden, Gray-Hawley type or regulation. Deck plates for filler of regulation type. Hatches to be bound with 16 gauge brass 1½ inch in width. To be screw fastened with oval head screws every 3 inches. To have a brass lifting ring in each hatch, including ice box cover. Scuppers already specified. Any other fittings considered necessary to be furnished by builder to make a complete job.

Rudder: To have a bronze blade of 5/16-inch thickness with 1½-inch stock. To be milled to fit blade and securely riveted, with a pilot at the bottom. To extend through special stuffing box, to hang a bracket fastened to stern post and to be fitted with a 12-inch standard quadrant. Connect to steerer with 5/16-inch bronze cable through 4-inch sheaves and necessary fair leads. Provide a turnbuckle for taking up slack. Top of stock to be squared or arranged with a pin, to attach tiller which shall also be provided. This to be made with an offset

(*Continued on page* 122)

Advertising Index will be found on page 126

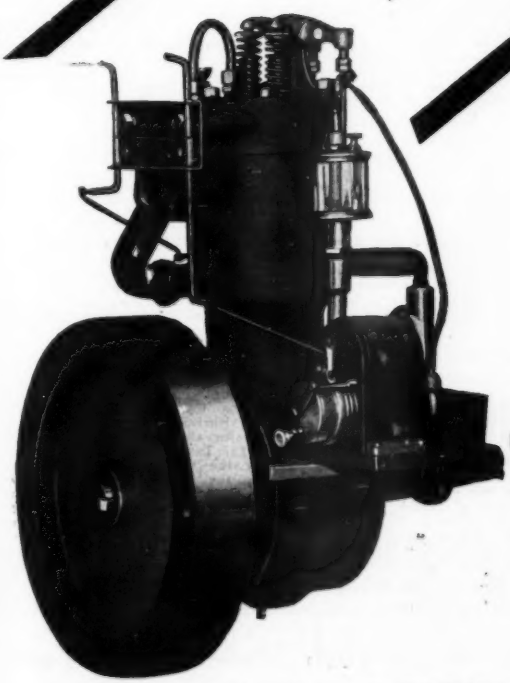
For Runabouts, Launches, Fishing Boats, Work Boats, Yacht Tenders, Auxiliaries



A TRULY high grade small motor. Handsome enough and smooth running enough for the finest family launch, yacht tender or runabout. Sturdy and dependable enough for fishing boats and work boats that must run 12 hours a day, 365 days a year.

Single cylinder, four cycle, overhead valve type developing 4½ H.P. on a weight of only 125 lbs.

MICHIGAN MARINE MOTORS for 1922



Many parts interchangeable with Ford motor parts. That means quick service and inexpensive replacement parts at any Ford Service Station, the world over.

Outfit "A" complete with Bosch Magneto & Impulse Starter..$135.00

Outfit "B" complete with water proof Timer, Battery & Coil..$115.00

F. O. B. Detroit, Mich.

Write today for complete description.

Michigan Marine Motor Corp.

7237 East Jefferson Ave. Detroit, Mich

Advertising Index will be found on page 126

Navigation By Dead Reckoning

(*Continued from page 26*)

earth by the intersection of a plane passed through its center. Think of a plane as a flat surface, having length and breadth, but no thickness. Or, more precisely defined, it is a surface such that if any two of its points be joined by a straight line, that line will lie wholly in the surface. Imagine this plane to be passed through a sphere, as we might pass a knife through an orange. Where the plane, or knife, cuts the surface all around, it will form a circle on the sphere. If the cut is through the center of the sphere, it will be divided exactly in half, and the circle made on the surface will be the largest which it is possible to draw. This is a "great circle." If the cut, or plane, does not pass through the center, a lesser circle will be formed on the surface, and this will be a "small circle."

The *equator* is a great circle on the earth's surface, every point of which is equidistant from the poles. It is everywhere 90° from each pole.

Parallels of latitude are small circles parallel to the equator.

Meridians are great circles passing through the poles.

The *latitude* of a place is the arc of the meridian intercepted between the equator and that place. Or, it is the angle at the center of the earth, between the plane of the equator and a line drawn from the center to such place. The *difference of latitude* between any two places is the arc of a meridian intercepted between their parallels of latitude.

The *longitude* of a place is the arc of the equator intercepted between its meridian and the meridian of some place from which the longitude is reckoned, generally Greenwich. The *difference of longitude* between any two places is the arc of the equator intercepted between their meridians.

Co-ordinates. If we wished to locate the point o on a sheet of paper, as in Fig. 2, it would be a simple matter. We could measure off so many inches from the left hand edge, then measure up so many inches from the bottom, and there is the point. It is simple, because we have a definite starting point and base line to measure from. Such measurements are made by using what are called co-ordinates. A surveyor will start at a monument at a street corner, and measure along the street so many feet. He will then turn his instrument at right angles to the first line, and measure across to a house, or other structure, and then take a diagram of the block and give the precise location of the edifice, with reference to the street line and corner. He is using co-ordinates. To say that a man's home is 2½ miles ENE from a rock near the river front five miles north of the Battery, would convey no definite idea of where he lives. But to say that he resides at the intersection of a certain street and avenue, or that he lives so many blocks east and so many north of a certain place, immediately brings up a definite idea of position. You are speaking in terms of co-ordinates. (See Bowditch §§ 230-231.)

Much the same plan is used in locating places on the earth. It would be indeed hard to locate a ship on the broad ocean by any reference to her direction and distance from a point of land. But when you say she is in a certain latitude and longitude, a definite idea of position is at once given. You can take the chart and put your finger on the precise spot where she happens to be.

Latitude and longitude are really co-ordinates which facilitate the location of places on the surface of the earth. They supply the base and intersecting lines, without which it would be quite impossible to designate positions on a sphere. Astronomers can locate the equator and the parallels of latitude, and also the meridians of longitude, with great precision, and these can be represented accurately by lines on maps and charts. Using the equator as a base line, and reckoning from it, latitude gives the north or south distance, or co-ordinate. By choosing one of the meridians, as that of Greenwich, for a point of reference, the east and west distances or co-ordinates may be obtained. By using both latitude and longitude intersections, any point on the earth may be precisely located. We can then refer to the chart, note how far we may be from the land, the direction in which our desired haven may lie, and the aids or dangers to navigation to be found along our course. Latitude and longitude divide the world into a huge checker-board, and the navigator's problem commonly is to find out in what square he happens to be. With this knowledge, he knows where he is, and can tell how to sail in order to reach port.

Latitude is reckoned along a meridian, North and South, from the equator, through 90°, to the poles. Longitude is reckoned along the equator, East and West, through 180°, from a designated meridian, called the Prime Meridian; the meridian of Greenwich, England, being chosen by most nations, including the United States.

Latitude and longitude are always measured in arc, never in miles. Every circle is divided into 360 degrees (360°), and each degree has 60 minutes (60′), and each minute 60 seconds (60″). Thus every circle has 360 x 60′ or 21,600′. But a nautical mile is approximately the equivalent of 1′ of a great circle of the earth. Now latitude is the arc of a meridian, and all the meridians are great circles. And since a nautical mile equals 1′ of a great circle, it follows that 1′ of latitude everywhere equals a nautical mile. Thus latitude (arc) is directly convertible into miles (distance).

The equator is also a great circle, and, therefore, 1′ of longitude *on the equator* equals one nautical mile. But as the meridians approach the poles, they converge or come together. Thus 1′ of longitude equals a nautical mile only at the equator, and everywhere else is less. The further one goes from the equator, the smaller the linear value of a minute of longitude becomes. Yet it must be remembered that in a small circle about the pole, there are as many degrees, minutes and seconds as on the equator itself. The *number* remains the same, but the *length*, in linear measure, is less.

Thus it is erroneous to speak of miles of latitude or miles of longitude. These terms are always arc. But their linear value on the earth may be converted into miles; directly in the case of latitude, and by computation in the case of longitude.

Course is the angle which the ship's track makes with the meridian.

Distance is the length of the line between any two places, measured in nautical miles.

Departure is the amount of easting or westing made good by a vessel from a certain point, measured in nautical miles. See Fig. 1.

The practical difference between difference of longitude and departure is that the former is always measured in arc, and the latter in nautical miles. The easting or westing made good, expressed in arc, is difference of longitude. The easting or westing made good, expressed in miles, is departure.

Departure used in this sense must be distinguished from the expression "taking a departure." To say that a vessel took her departure from Sandy Hook Lightship, means that the position of the lightship was used as the commencement of the dead reckoning, or was the point reckoned from. Departure in a dead reckoning problem means easting or westing made good, measured in nautical miles.

A nautical mile is 6,080 feet. It equals 1′ of arc on a great circle of the earth. The nautical mile is a distance measure. The knot is a speed measure. Thus a vessel may sail 50 miles (distance) at a speed of 12 knots.

The *rhumb line*, also known as the *loxodromic curve*, or *equiangular spiral* is the curved line joining any two places on the earth's surface, cutting all the meridians at the same angle. Were the meridians parallel, a line crossing them all at the same angle, would necessarily be a straight line. Fig. 3. But the meridians converge toward the poles. Thus a line cutting the successive meridians at the *same* angle, must be a curved line. Fig. 4. In the drawing, where the meridians are placed some distance apart, the line is made up of a number of short straight lines, the whole having a generally curved appearance. But if we imagine an infinite number of meridians very close together, then the line would become practically a true curve.

The course indicated by the compass is a rhumb course.

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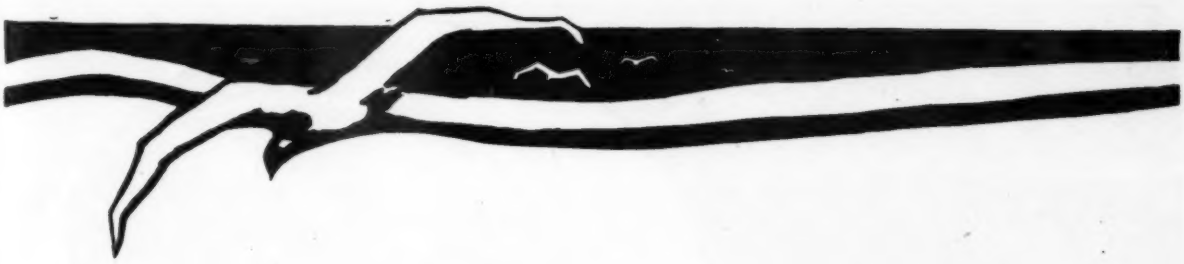


Dual Valves
Removable Heads
Hot Spot Manifold
All Enclosed
Self-Lubricating

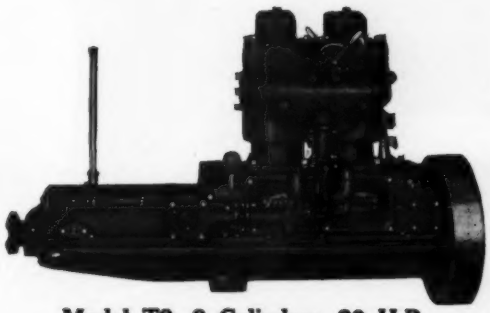
THESE five features make the new Model "T" an important addition to the "friendly" Frisbie family of valve-in-head motors. Its three sizes are suitable for a wide range of service.

Model T2, 2 cylinders, 20 H.P., is a heavy duty, medium speed motor made for heavy work boats of moderate size, fishing boats, commercial boats and pleasure boats. Also, because of its cleanliness and quiet, efficient performance, it is a fine auxiliary power plant for sailing yachts.

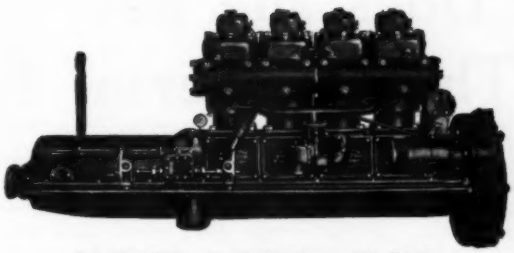
Model T4, 4 cylinders, 50 H.P., is another heavy duty, medium speed motor in larger size made for the same sort of service as Model T2.

Model T4 Special, 4 cylinders, 100 H.P., is a high duty, high speed motor made mostly for the larger and faster pleasure boats of the Express Cruiser type.

The "Friendly" Frisbie Catalog, and a more detailed description of these new models, gladly sent on request.



Model T2, 2 Cylinders, 20 H.P.



Model T4, 4 Cylinders, 50 H.P.
T4 Special, 100 H.P.

THE FRISBIE MOTOR CO.
7 College St., Middletown, Conn.

Frisbie
VALVE-IN-HEAD
MOTOR

"Does she go? I'll say she do! That Universal Engine is a winner."

It takes the young bucks to know what a real motor boat engine is. Just get hold of one who has a Universal engine for the first time and see him brag. The Universal gives him a boat with a "thrill" to it—a baby that steps right out in front and shows her heels to the whole bunch.

The Universal isn't a racing engine, but it certainly is a speedy one. But more important than that is the fact that her smooth, steady 4 cylinder power can be depended upon all the time.

For years the Universal Marine Motor has been the standard 4 cylinder 12 h. p. engine—one of the pioneers of its kind—and the unquestioned leader today. It is used not only nationally, but internationally, for all types of boats—auto boats, launches, fishing boats and work boats from 15 to 30 feet in length. It is equipped with electric self starter and reverse gear, if desired.

Get the Universal catalogue and get the facts. Don't let motor boat time come without experiencing the satisfaction of the ownership of a Universal power boat.

Revised prices downward are now in effect.

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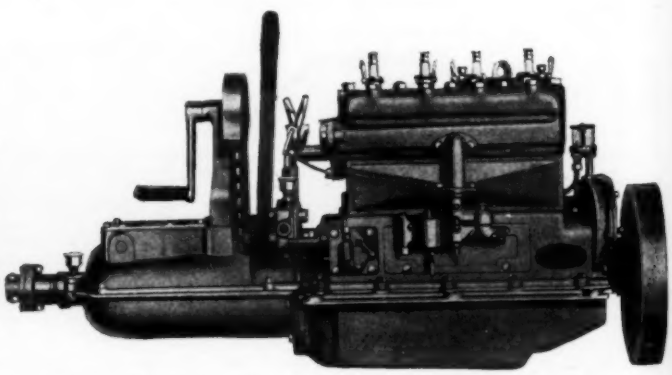
Universal

4 Cylinder 9-12 H.P. MARINE MOTOR



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Navigation By Dead Reckoning

(*Continued from page* 112)

That is to say, after the compass course has been corrected, and converted into a true course, it is a rhumb course. The rhumb line is curved. Therefore, it is not the shortest distance between two places. Were we sailing only a few miles, this cuvature would be of no importance. So great is the earth, and so gentle the curve, that for a short distance it would be difficult to distinguish it from a straight line. But on a long voyage, the curve might become such as to create a difference, between the rhumb track and a straight line, of a considerable number of miles. At the beginning of such a voyage, a vessel on a rhumb course would not be headed directly towards her port of destination. But as she proceeded, she would gradually swing more and more in its direction, until finally, at the end of the voyage, she would be headed directly toward her port, thus completing the curve. For instance, the rhumb course from New York to the Lizard, England, is about N 79° E. But take a globe, and lay off a straight line at an angle of N 79° E with the meridian of New York. You will find that the straight line points off towards the Northwestern coast of Africa. But if you were to sail a rhumb course of N 79° E, it would gradually curve around, as you proceeded, so that finally it would take you to the Lizard.

A great circle of the earth cuts a straight line on its surface. This may puzzle some one. How, he may ask, can a circle be straight? It all depends upon the plane from which you look at it. We take a hoop and fit it around a barrel. As we look down upon the barrel from the end, we see the hoop as a circle. But if we look at the barrel sidewise, the hoop appears to cross the barrel in a straight line. Again, suppose we take a piece of string and stretch it snugly around a globe, say at the equator. As we look down upon the globe, from a point over the pole, we see the string as a hoop or circle around the earth. But as we look at it from a point over the equator, we see the string running east and west in a straight line, or, we might say, in a straight direction. Now, when we say that the great circle connecting two points on the earth is a straight line, we do not mean that it is literally and geometrically a straight line connecting the two points, for such line would pass through the earth and beneath its surface. The great circle line is on the surface, and follows the earth's curve. This is equally true of the rhumb line. When we call the great circle a straight line, we suppose that we are viewing it with the eye in line with the plane which cuts the circle, and we see the great circle on the surface as a line running in a straight direction between all points along it. And herein the great circle differs from the rhumb line, which, while also following the curvature of the earth's surface, does not run over the surface in a straight direction, but by a curved path.

A straight line is the shortest distance between any two places. So the arc of a great circle joining two places on the earth, called the great circle track, is the shortest distance between them. It joins them in a straight line or direction over the surface, while, as above stated, the rhumb track joins them in a curved line or direction. A great circle need not run north and south like the meridians, nor east and west like the equator. It may run in any direction, dependent upon how the plane which cuts it on the surface is passed through the earth's center. Obviously, a great circle running in any direction between the cardinal points, would cross the successive meridians at different angles. For it is a straight line, while the meridians converge, and it is impossible for a straight line to cross converging lines without making a different angle at each. Fig. 4. A vessel on a great circle track is always headed for her port of destination, because she is on the straight line leading thereto. When the sailing is along the equator, the great circle and rhumb courses coincide.

The student is advised to read the first chapter of Bowditch (pp. 9-10) which contains excellent definitions and explanations.

	Abbreviations
Latitude	Lat
Difference of Latitude	DL
Longitude	Long or Lo
Difference of Longitude	DLo
Course	C
Distance	Dist
Departure	Dep

In the next lesson, the necessary elements of dead reckoning trigonometry will be explained.

Advertising Index will be found on page 126

No Heavier than a Good String of Fish

FOR you outdoor men and women, whose playgrounds are the lakes and streams of many states brought within easy reach by motor car, train or trolley—for you has been designed and perfected this lighter, more portable rowboat motor—the Evinrude "Lightweight".

Weighing not quite 50 pounds, *complete*—21 pounds less than the Standard Evinrude—this new sport model is the lightest practical outboard motor made. Weight has been saved and strength maintained by replacing many bronze and malleable parts with aluminum alloys.

Practically the counterpart of the Standard 2 H. P. model in design, and its equal in power and speed, the "Lightweight", though not intended for such rugged service, is a motor entirely worthy of the Evinrude name.

Either Evinrude model, Standard or "Lightweight," is an ideal power plant for dinghy or tender. Quickly attached or detached —takes but little space when not in use. At the races, especially, the Evinrude-powered small bôat is the handiest craft of all, because of its short turning radius and all-around "cleverness".

EVINRUDE MOTOR CO.

634 Evinrude Building, Milwaukee, Wis.

See these Evinrude motors at your sporting goods or hardware dealers. Or write for catalog and new prices (recently cut to pre-war level).

DISTRIBUTORS:

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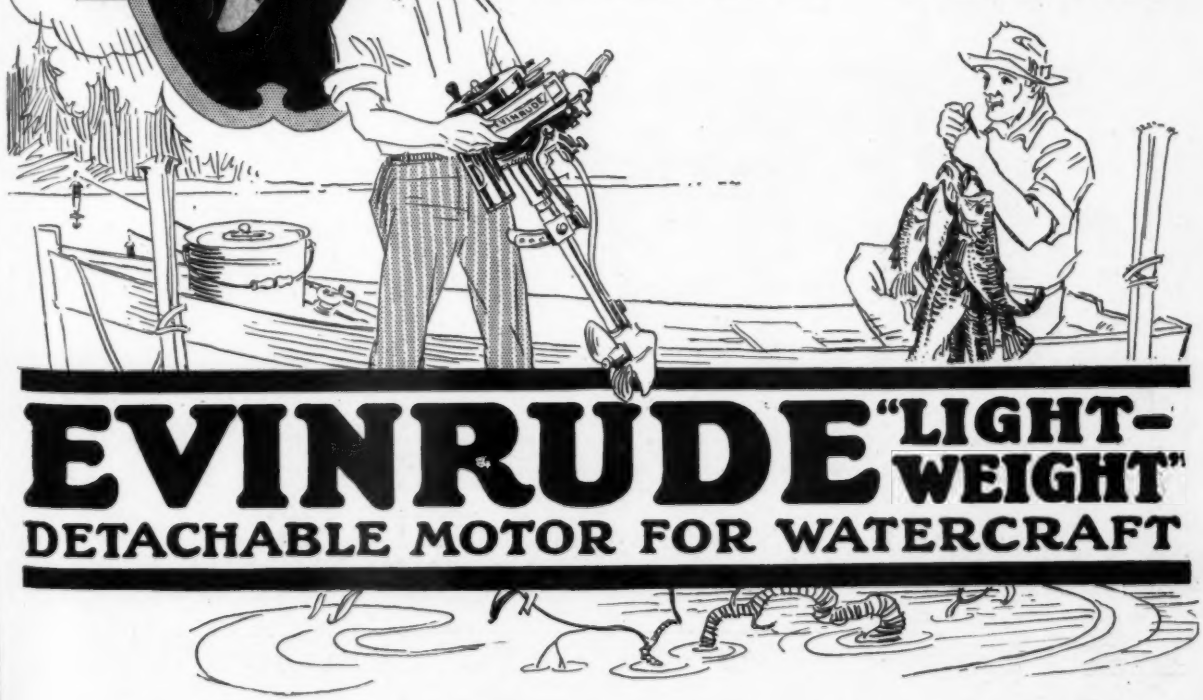

EVINRUDE "LIGHT-WEIGHT"

DETACHABLE MOTOR FOR WATERCRAFT

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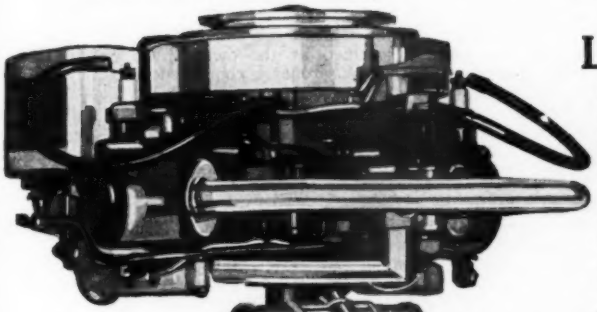
Advertising Index will be found on page 126

Why Row Where You Want to Go?

—When you want to make a quick trip to or from shore—
—When you want to go quickly to the spot where fish bite best—
—When you want to explore shallow waters—
—When you want to go anywhere with rowboat or canoe—



Let the JOHNSON Take You

Just drop this marvelous 2 H. P. Twin Cylinder Motor over stern of rowboat, tighten two thumb screws, give the handy cord starter an easy pull and you plow through the water at a speed that will surprise you. Note the absence of usual noise and vibration. There is no shaking of the boat. No noise to drown out voices. The Johnson is the sensation of the season in the Outboard Motor field. Designed by men who built the first V-type multiple cylinder marine motor and the first American Monoplane. The Johnson sets a new mark in power, speed and durability together with the elimination of 15 to 50 pounds of needless weight.

Almost as Easy to Carry as a Pair of Oars

Think of it! Weighs only 35 pounds complete making it really portable as well as detachable. A 12 year old boy can carry it. Has a built-in Quick Action Magneto. There are no batteries to carry or replace. No extras to lug. Spark and Throttle Control (like auto) is provided giving a wide range of speeds. A real carburetor takes the place of the troublesome mixing valve. Instant reverse, stops boat at full speed in half its own length.

There are no grease cups or oil cups to drip oil on to seat or to soil clothing in carrying. Fits any boat. Takes apart easily at one joint for packing into handy carrying case.

Every Johnson outboard motor is guaranteed to operate satisfactorily as claimed and to be free from defects in material and workmanship.

THE LIGHTEST OUTBOARD MOTOR IN THE WORLD

Weighs Only 35 Pounds

Easy Starting Self-Tilting

Has very simple cord starter. No rachets, gears or springs. No projecting knob on flywheel to injure operator. No wrenches required. The Johnson automatically tilts freely the instant it strikes submerged logs, sand bars or other obstruction, passes safely over, protected by propeller skeg, and comes back into position without attention. Tilts by hand in shallow water to drive boat well up on beach. Write for FREE Illustrated Catalog Folder.

Special Inboard and Outboard Installations for Canoes

Attached to canoe, the lightweight powerful Johnson travels at thrilling speed. Its complete absence of vibration prevents shaking canoe and opening of seams. Its extremely light weight prevents top heaviness and dipping.

DEALERS: Write for unusually attractive proposition.

JOHNSON MOTOR CO. 860 Sample St., South Bend, Ind.

Johnson

DETACHABLE MOTOR for Boats and Canoes

"Built on the banks of the St. Joe"

Margie, a 31-Foot Hacker Cruiser

(*Continued from page* 108)

so as to operate through the hatch.

Strut: To be of manganese bronze of Hacker type. Bolted through keel and shoe, with bronze bolts.

Shaft Log: To be either of the wooden type through bolted to keel fitted with regulation or No-bind stuffing box, or Mechanical Devices Company type pattern KS for 1¼-inch shaft. Either to be laid on canvas with heavy paint and securely bolt fastened.

Shoe: To be of ½ by 2¾-inch bronze and through bolted. End to be turned and to have ¾-inch hole to take end of rudder stock, secured with cotter pin.

Gas Tanks: To consist of two 20 by 28-inch standard Jasco tanks. To have 2-inch standard pipe openings carried to deck with 2-inch pipe to standard deck filler plates. Tanks to be properly chocked into place and securely clamped. To have stand-pipe extending to within ⅜-inches of the bottom, supply to be taken through same.

Water Tank: Water tank to be fitted if desired of such capacity as may be specified by the owner. To be installed under raised platform and properly connected to galley. To be either copper or galvanized iron type.

Motor and Installation: Motor to be a 20 h.p. Kermath. To be properly aligned and bolted to foundation. To connect with 1¼-inch bronze shaft which is to be keyed and pinned to coupling and to have standard taper on end. To be fitted with a three bladed 20 by 20-inch propeller. Exhaust line to be preferably of 2-inch copper tubing with flange joints. Or glavanized iron pipe may be used. Exhaust line to extend through transom at the stern and to have a ring with asbestos packing around the wood. All water piping to be of regulation type as used in best marine practice, to have seacock-valve and regulation intake. Gasoline to be supplied through Stewart vacuum tank to be mounted under platform. To connect to tanks with ⅜-inch copper tubing having a valve at each tank. All joints to be made with S.A.E. fittings. Vacuum tank to be provided with a drain cock as well as a strainer and valve at the carbureter. All wiring to be of such kind and size as specified by motor manufacturer and all work to be executed in a first class manner. Battery is to be properly cleated. A reserve oil tank of not less than ten gallons capacity is to be installed under seat. Motor switch and controls to be carried to steering housing. Reverse gear controls to be carried to the same place so as to allow full one-man control.

Electric Lighting: All wiring to be made up with suitable wire for the purpose to have one circuit to running lights. One to aft of flag pole and one for the spot or search light. The cabin lights to be on a separate circuit with one main switch. To have one light in toilet room, one on each side of sky light in main cabin. One over galley and one on opposite side, to be of regulation sun-burst type, and fitted with independent switches. Also to have plug-in for trouble light. All wiring in cabin roof to be concealed. All wiring to be executed in a workman like manner and to be fully tested.

Equipment: Furnish and install properly the following: Cushions to be of 4-inch thickness, covered with Moleskin material, kapoc filled. Cushion on aft seat to be 2½-inches thick of the same material. Six regulation life preservers. 8-inch standard bronze bell. One fog horn. Two Pyrene fire extinguishers with brackets. Two sets of pilot rules. One 40 lb. stockless anchor. 150-feet ¾-inch manila line. One 50-foot and one 40-foot painter lines of ⅝-inch manila. One large size bilge pump. One 8-foot boat hook with cleats.

Awning: To be of the regulation type with ½-inch standard brass or galvanized iron pipe stanchions fitted into standard sockets. To be either of the bow type or to have a wooden top with special side fittings. To have ⅜ by 2-inch battens cleated to the top and to be covered with 10-oz. khaki duck Side curtains to be of 8-oz. khaki duck. To be suitably fastened to coaming, etc., and to have a 3/16-inch cable stay on forward end also an auxiliary for stern.

* * * *

The Highest Priced Power Plant

The highest priced marine motor is the $25,000 Allison motor, manufactured by the Allison Engineering Company. This recently introduced motor is the finished product of three years of engineering research, design and testing. The motor is a twelve-cylinder, Vee type 400 h. p. at 1400 r.p.m. Bore 5½ inch, stroke 7½ inch. Weight, 4,400 pounds.

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MoToR BoatinG Advertising Index

Both Sides of the Piston Question

A true account of how DELUXE Pistons make good

Why Ordinary Pistons Are so Heavy

Ordinary pistons are heavy because, owing to their design, a large amount of metal is required to give them the necessary strength.

When this excess weight of metal is traveling up and down in the cylinders it *Wastes Power* in proportion to the square of its speed,—(Twice the speed means four times as much power wasted)—power that should be delivered to the rear wheels.

The vibration is excessive in proportion to weight and speed. The oil consumption is in proportion to clearance and weight. More gas is required to stop and start excessive weight.

Ordinary stock factory cast pistons cannot be fitted close with any degree of safety, as they radiate the heat of the explosion slowly, hence expand considerably and are apt to bind or score the cylinders.

And if they *are* fitted loosely, they permit oil pumping, gas leakage and noisy piston slap.

Ordinary pistons are heavy because until DELUXE pistons were made the only way to get a light piston was to use aluminum or alloys.

The Inside Story of DELUXE Pistons

Look inside a DELUXE piston. See the scientific re-inforcing ribs extending down the inside and across the head of the piston to a reinforcing ring. Notice how thin the walls are.

A DELUXE lightweight cast iron piston is so designed that although only about half as much metal is used as in ordinary pistons, it is actually stronger where strength is needed.

A DELUXE piston, because it is 40 to 50% lighter than ordinary stock factory cast pistons, makes a motor far more powerful, flexible and speedy.

Look at the re-inforcing ribs again. Each one of them radiates heat rapidly. There is more than twice the heat radiating area inside a DELUXE piston. This means a cool running motor, but what is more important, it means that DELUXE pistons can be fitted very close, as they expand only a very little—and at the same rate as the cylinder walls.

DELUXE pistons, therefore, eliminate gas leakage, oil pumping and piston slap. DELUXE equipped motors run with practically no vibration, hence with very little upkeep expense.

All Good Things Are Imitated, but Look Inside for the Name "DELUXE." It is there for Your Protection.

Dealers and repair men all over the country are making money and satisfied customers with DELUXE pistons. They are cashing in on our nation wide advertising, including the Saturday Evening Post, and are following it up with profitable sales efforts of their own.

DELUXE pistons and core-boxes for making the same are thoroughly protected by U. S. and foreign patents. We intend to vigorously defend our rights and prosecute all infringers.

DELUXE
LIGHT WEIGHT CAST IRON PISTON
"The Successful Light Weight Piston" ©

Patented and Manufactured by

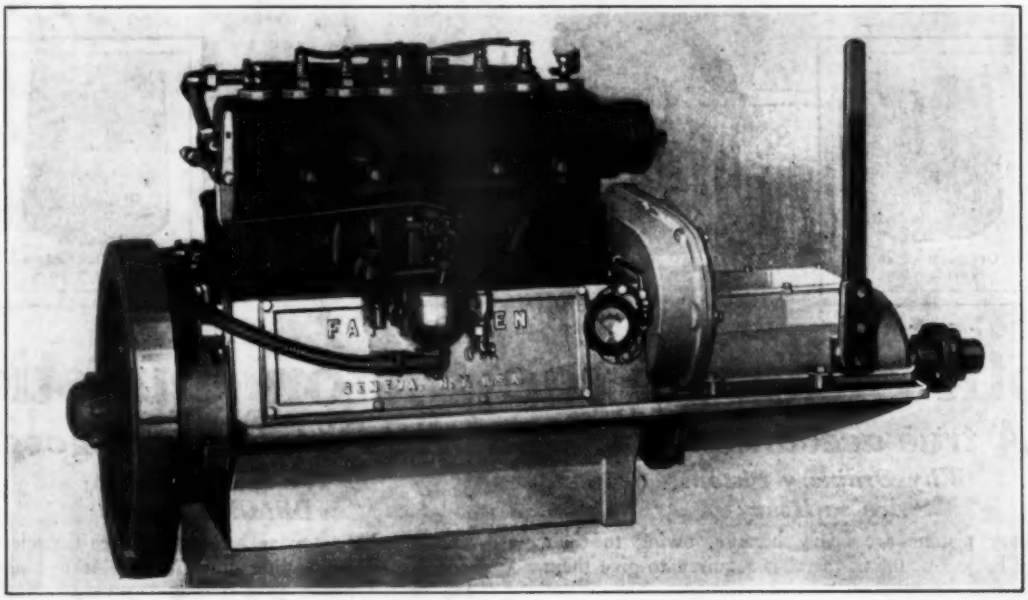
Clark-Turner Piston Company

LOS ANGELES INCORPORATED CALIFORNIA

no back cover

OUR NEW BABY

Some Infant!!



FAY & BOWEN ENGINE, MODEL LN-41

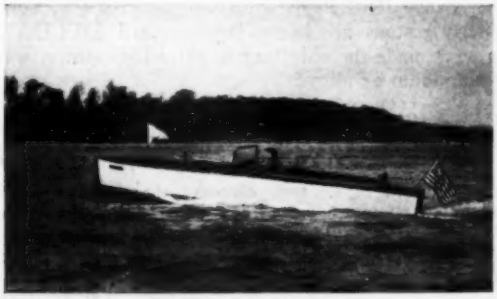
4-Stroke-cycle, 4 cylinder, L-head type.

Bore $3\frac{1}{2}$" Stroke $4\frac{1}{2}$"

23 Horsepower

Very reliable, very quiet, very accessible, very powerful, very husky, very good-looking, very up-to-date and very reasonable. Thoroughly tested during the past season in actual service.

Fay & Bowen Junior Runabout 24' x 5' 0" Powered with LN-41 Motor Speed 16 M.P.H.



RELIABILITY F&B

FAY & BOWEN ENGINE COMPANY

104 LAKE STREET, GENEVA, N. Y., U. S. A.

NEW YORK: 44 Third Ave. at 10th St., Sutter Bros., Representatives
PHILADELPHIA: 116 Walnut St., Marine Equipment & Supply Co., Representatives
BOSTON: 84 Atlantic Ave., Gray-Aldrich Co., Representatives

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